

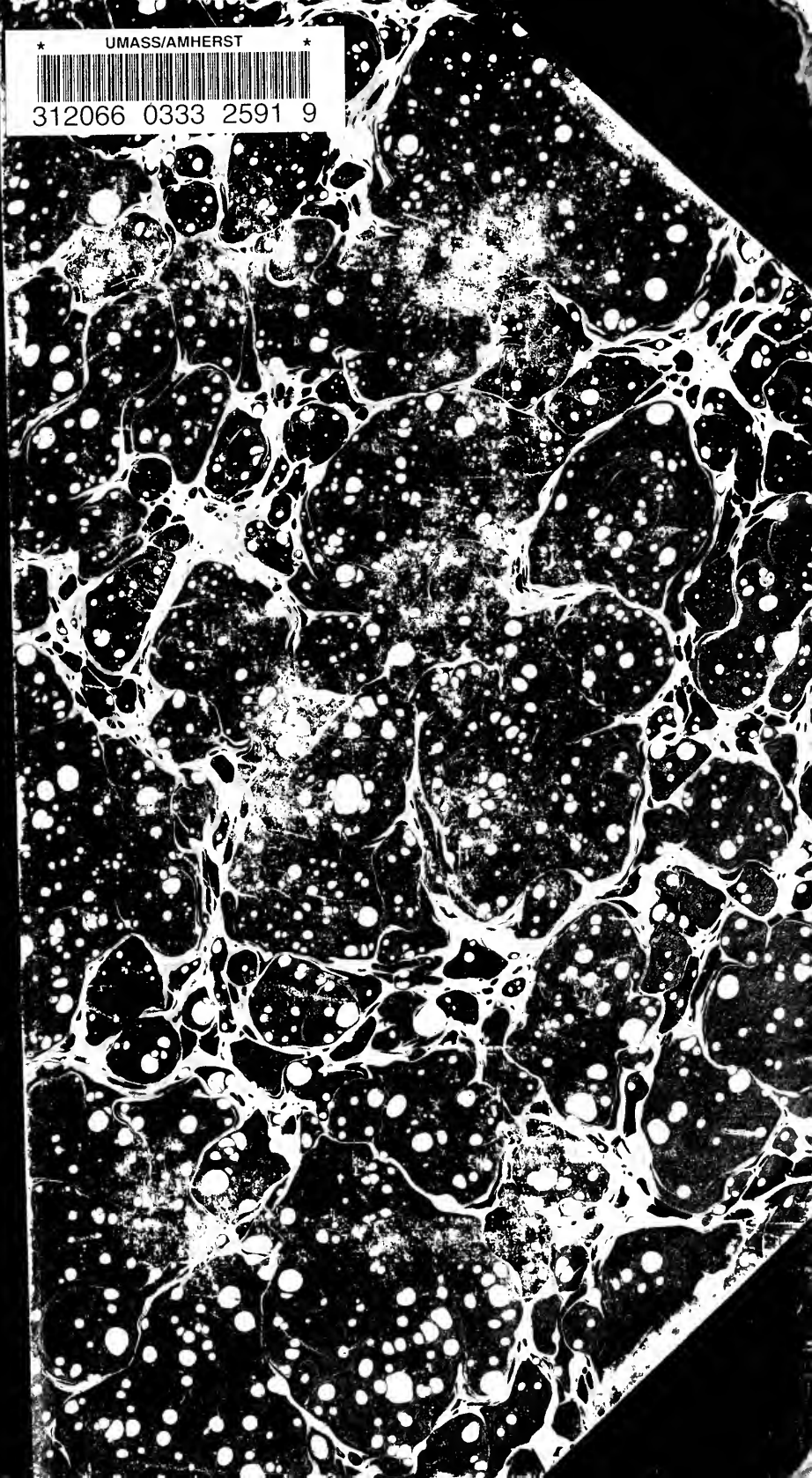
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MASSACHUSETTS CROP REPORT

FOR THE

MONTH OF MAY, 1898.

ISSUED BY

WM. R. SESSIONS,

SECRETARY STATE BOARD OF AGRICULTURE.

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CROP REPORT FOR THE MONTH OF MAY, 1898.

OFFICE OF STATE BOARD OF AGRICULTURE,
BOSTON, MASS., June 1, 1898.

We present herewith Bulletin No. 1, Crop Report for the month of May, the first of our series of monthly crop bulletins for the present season. We shall follow out the same general plan in the issuance of these bulletins as that adopted last year, in particular endeavoring to place the bulletin in the hands of our readers as near to the close of each month as may be. As in former years, an article by some specialist of the Board, or some other equally well-known scientist, will be included in each issue. This bulletin contains an article on "Nature's Foresters," by E. H. Forbush, ornithologist of this Board.

PROGRESS OF THE SEASON.

The May returns of the United States Department of Agriculture (Crop Circular for May, 1898) show the acreage of winter wheat to be 5.7 per cent greater than last year. In twenty-two of the thirty States where winter wheat is raised the area devoted to it is increased by 2,097,513 acres, and in eight other States there is a decrease aggregating 685,821 acres, the net increase being 1,411,692 acres. The average condition of winter wheat is 86.5, against 86.7 a month ago and 80.2 on May 1 of last year. The State returns vary from 105 for Kansas to 26 for California. The crop in the latter State is said to be the poorest ever raised there.

The average condition of winter rye is 94.5, as compared with 92.1 one month ago and 88 last year. Pennsylvania leads the States of principal production with a percentage of 97. With few exceptions the reports on the condition of winter rye are exceedingly favorable.

The reports on cotton deal only with the contemplated acreage, as compared with acreage planted in 1897. Some

reduction is reported from every cotton-growing State, the general result indicating a reduction of 6.6 per cent from the acreage of last year.

The average condition of meadows is 92.9, against 93.4 on May 1 of last year. The averages of the fourteen principal hay-producing States range from 102 for Nebraska down to 58 for California.

The average condition of spring pasture is 91.2, against 93.4 at the corresponding date in 1897. Exceptionally high averages prevail throughout New England. In California the pastures have suffered severely from protracted drought, the present condition being 46.

The proportion of spring ploughing usually done by May 1 is 75.8 per cent of the whole amount. The proportion done this year is 72.4, against 61.9 last year. Among States in which ploughing is unusually advanced are New York, Pennsylvania, Michigan, Iowa, Nebraska, Wisconsin, Minnesota and North Dakota.

In Massachusetts the average condition of meadow lands May 1 was 98; the average condition of spring pasture, 98; the proportion of spring ploughing already done, 53; and the proportion usually done, 50.

WEATHER SUMMARY, JANUARY TO APRIL, 1898.

[FURNISHED BY THE WEATHER BUREAU, BOSTON.]

January was about normal in temperature and considerably above the average in precipitation. The principal meteorological feature of the month was the unusually severe storm of January 31 to February 1. This storm is generally considered to have been more severe than the memorable "blizzard" of March, 1888, and in some places no storm since January, 1867, has equalled it in violence. Heavy snow fell all night of the 31st to 1st, and the wind blew a gale from the north-east. On the morning of February 1 Massachusetts, with the rest of New England, was completely snowbound; railroad traffic was completely at a standstill for nearly twenty-four hours, and along our coast from Cape Ann to Cape Cod many vessels were wrecked, nearly two score of mariners losing their lives; the money loss has not

been accurately determined. The ice crop was harvested during the month under generally favorable conditions.

February was above the normal in both temperature and precipitation, but the snowfall was generally moderate throughout the State. The first part of the month was very cold, temperatures of zero and below being generally reported on four successive mornings; later in the month the weather was mild, with a maximum of 50° or above on the 10th. There was much cloudiness and rain and an unusual hail and sleet storm on the 19th to 22d. At Fitchburg fine hail fell continuously for forty-two hours, and then sleet for nineteen hours. In the central southern portion of the State ice three inches thick formed on the sides of trees, stripping them clean of branches, while small trees were broken down to the ground and entirely destroyed.

March was remarkably mild and pleasant. At the end of the month the ground was generally in good tillable condition, with snow gone and frost almost entirely out. The season was considered from two to three weeks in advance of the average. The precipitation was deficient and the snowfall very light. The month was singularly free from severe storms and gales. The greatest amount of precipitation, 4.27 inches, occurred at Vineyard Haven; this amount was also the maximum for New England. The temperature was at 60° or above on several days, but the minimum values were unusually high. Without doubt there have been previous Marches warmer than this of 1898, although the fact can be determined only by comparison with long records of single stations. At New Bedford, Mass., the Marches of 1825 and 1871 were warmer than this of 1898, while those of 1831, 1842, 1859, 1865 and 1878 differed but slightly from it. Comparison with other reliable records would presumably reveal facts similar to the preceding.

The prevailing weather of April was most unfavorable for agricultural pursuits. The remarkably mild weather during March, with bright, sunny days, presaged an early spring. April in some parts of the State was the coldest and wettest on record, and all preliminary farm work was greatly retarded. The average temperature deficiency was about 3° , with the highest temperature of about 70° on the 17th. The

general minimum occurred on the 4th, and averaged about 20°. The precipitation was excessive and the number of rainy days large. The latter part of the month was particularly stormy, with precipitation in some part of the State on nearly every day.

TEMPERATURE AND RAINFALL FOR THE WHOLE COUNTRY.

[FROM UNITED STATES CLIMATE AND CROP BULLETINS.]

Week ending May 2. — The week was cooler than usual in the central and east Gulf States, throughout the Atlantic coast districts and in portions of the lower Missouri valley. From the east Gulf coast to northern New England the deficiency generally ranged from 3° to 7° per day. The week averaged warmer than usual in the lake region, upper Mississippi and Red River valleys, in the interior of California, the central and southern Rocky Mountain and plateau regions and in Texas. From March 1 to date the temperature has averaged higher than usual from the Missouri valley eastward to the Atlantic coast. Excessive rains fell during the week in southern Illinois, Missouri, northern Arkansas and eastern Kansas, also along the immediate coast from the Carolinas northward to southern New England. The week was drier than usual in the Gulf States, eastern Tennessee, upper Ohio valley, lake region and the interior portions of the Atlantic coast districts. Slow progress has been made with corn planting in the central valleys. Except in California, the reports concerning winter wheat continue favorable. Cotton has come up with poor stands generally.

Week ending May 9. — The week was cooler than usual throughout the entire country, except on the immediate South Atlantic coast, in the central valleys of California and in western Oregon and Washington. The temperature deficiency ranged from 2° to 9° per day in New England, the middle Atlantic States and the central valleys. The rainfall was largely in excess of the average in southern New England, the middle Atlantic States, the Ohio and central Mississippi valleys and west central regions. Portions of the Ohio valley, Middle Atlantic States and southern New England received from 2 to 5 inches. The seasonal precipi-

tation from March 1 to date has exceeded the average over portions of New England and the middle Atlantic States, throughout the Ohio valley and over the greater portion of the upper Mississippi valley. Slow progress was made in corn planting in central and northern sections. The general condition of both winter and spring wheat continues very promising.

Week ending May 16. — The departures from the average temperature conditions during the week were generally slight. It was warmer than usual in the lake region, the Ohio valley, the greater portion of the Mississippi valley, throughout the Rocky Mountain region and in the north Pacific States. It was 1° to 3° per day cooler than usual in New England, near the middle Atlantic coast, in the Florida peninsula and along the Gulf coast. There was more than the usual amount of precipitation over an area extending from the lower Missouri valley eastward over Illinois, Indiana and Ohio, including the greater part of the middle Atlantic States. In California, where protracted drought has prevailed, from 1 to 1.50 inches fell. On the north Pacific coast, generally throughout the Rocky Mountain region and from the upper Missouri valley eastward to the lake region the week was drier than usual. Under the favorable conditions prevailing farm work and growth of crops make exceptional progress. Corn planting in the principal corn States of the central valleys made rapid progress.

Week ending May 23. — The week was generally warmer than usual east of the Rocky Mountains, except in the Lake Superior region and the mountain region of northern New England, where it was somewhat cooler. It was also cooler than usual throughout the Pacific coast States and the Rocky Mountain regions. The week was marked by exceptionally heavy precipitation in the lake region, the lower Ohio, central and upper Mississippi, Missouri and Red River valleys. The week was drier than usual in northern New England, the upper Ohio valley, in the South Atlantic States, along the west Gulf coast, in southern Texas and throughout the southern Rocky Mountain and south Pacific coast regions. The weather conditions were most favorable for crop growth

throughout the central valleys, lake region, Middle Atlantic States, New England and on the north Pacific coast. Winter and spring wheat are generally in excellent condition. Cotton shows a general improvement.

SPECIAL TELEGRAPHIC REPORTS.

[WEATHER BUREAU, BOSTON.]

Week ending May 2. — New England. Boston: Cold, wet, backward week, with two hard frosts in interior; farm work nearly at a standstill; ground water-soaked and many fields too wet for cultivation; grass making good growth; tobacco beds in fair condition.

Week ending May 9. — New England. Boston: Continued unfavorable weather, excessive cloudiness, frequent rains and low temperature; week practically lost on many farms; no planting of consequence, except on sandy soils; grass continues in fine condition; good hay crop promised; heavy fruit bloom.

Week ending May 16. — New England. Boston: Generally favorable weather; crop condition slightly improved; several heavy frosts, but no particular damage; grass continues excellent; potatoes being extensively planted; tobacco plants ready to set.

Week ending May 23. — New England. Boston: Favorable week in all sections; all vegetation advanced rapidly, and all crops in excellent condition; farm work rushed with good progress; tobacco plants improved; rain needed in Maine.

WEATHER FOR MAY, 1898.

May opened with pleasant, mild weather, but by the 3d stormy conditions again prevailed, and frequent light rains, with cold, north-easterly winds, were the rule. From the 6th to the 15th the conditions were much more favorable, and no precipitation occurred except a few scattered thunderstorms in the western portion of the State. During this period several mornings were quite cool and frosty, notably the 10th, when the temperature fell to freezing or slightly below in the interior. On the 16th moderate showers fell, and on the 19th similar conditions prevailed, but the weather during the third week of the month was generally favorable,

with more sunshine and summer temperature of about 80° or slightly above on the 19th and 20th. The last week of the month was remarkable for the amount of cloudiness and rain ; at Boston about 3.25 inches of rain fell during the four days from the 24th to 27th inclusive. This extended cloudiness and storm was caused by the very slow passage of a storm up the Atlantic coast, where it remained stationary south of New England for about forty-eight hours. No high gales accompanied this storm, but the temperature remained low, with much fog and thick weather along the coast sections until the closing days of the month. Taken together, April and May have been most unfavorable for farming operations, and, unless June brings bright, sunny weather, many crops will be almost complete failures. This cold, cloudy weather, which has been so prevalent during the past two months, has been largely caused by the passage of many storms to the south of New England instead of down the St Lawrence valley, as is usual at this time of the year, when they cause showery rather than stormy conditions.

In the circular to correspondents returnable May 23, the following questions were asked : —

1. How does the present season compare, agriculturally speaking, with a normal one?
2. What is the promise for pastures and mowings, and did fall seeding winter well?
3. How did the fruit bloom compare with the bloom of former years?
4. What insects appear to be doing the most damage in your locality?
5. To what extent is spraying practised against insects attacking fruit, and is it on the increase in your locality?
6. Is farm help scarce, or plenty ; and what proportion would you call good help?
7. What wages, with board and without board, are paid farm help in your vicinity?
8. Will there be any marked change in the acreage of the usual farm crops, and do you note any new enterprises in the line of agriculture?

Returns have been received from 184 correspondents, and from them the following summary has been made up : —

THE SEASON.

The spring thus far since the first week in April has been rather cold, with an excess of moisture. This has been excellent for grass, but has delayed all planting and farm work and held vegetation somewhat in check. The returns indicate that the season is at present about a week behind the normal in most sections. Low lands are still too wet to work in many localities. With warm, dry weather the season would soon come up to the normal, but continued coolness and excessive moisture would be most injurious to many crops.

PASTURES AND MOWINGS.

Mowings are reported everywhere to be in first-class condition, and a good hay crop would now seem to be assured. What with the abundant moisture of last season and the copious rains thus far in this, pastures have secured a remarkably good start, and now promise to give a good supply of feed throughout the season. The returns show fall seeding to have wintered well in almost every case, and, like all other grass, it has made a good growing start.

THE FRUIT BLOOM.

The fruit bloom appears on the whole to be about the average bloom of a bearing year. Apples generally made a full bloom, though there are some complaints that Baldwins did not blossom as fully as other varieties; this cannot, however, be called general. Pears, cherries and plums appear to have made a good bloom, though there are a few complaints of a shortage in pears and plums. Peaches seem to be below the normal, many localities reporting no blossoms at all. Small fruits and berries generally blossomed full. The fruit bloom is perhaps a trifle late, although the correspondent in Fitchburg reports that apple trees bloomed one day earlier than the average for forty-two years.

INSECTS.

As yet but little damage from insects is reported. Probably the cold, wet spring has done much to hold them in check. As usual, the tent caterpillar is the insect oftenest spoken of as doing damage, but it appears to be nowhere

unusually prevalent. There are very few complaints of injury from canker worms. Other insects spoken of as doing damage are currant worms, potato beetles, cut worms, white grubs, wire worms and asparagus beetles.

SPRAYING.

Spraying is not practised nearly as much as it should be by the farmers of the State. Most large fruit growers spray their orchards thoroughly, and all farmers would find it profitable to spray, even if they only raise fruit enough for their own use. The improvement in the quantity harvested is usually a small item in comparison to the improvement in quality. This year, as formerly, the returns point to an increase in the practice, which, is constant, if slow. We would again refer our readers to our Crop Report for May, 1896, for a few practical hints on spraying.

FARM HELP AND WAGES.

Strictly first-class help is now, as always, hard to secure; but there would appear from the returns to be a considerable supply of good help to be had. Many foreigners have come into the State in the past ten years, and most of them are now efficient farm hands. Some of these men have begun to acquire land for themselves, but most of them are still working as laborers. Wages average about \$17 to \$18 per month with board. Board is reckoned at from \$12 to \$17 per month, and where men are hired by the month without board there is a corresponding increase in the wages paid. Day wages average about \$1.25, with \$1.50 in haying and harvesting time. In some cases as high as \$2 per day is paid, but this is unusual.

ACREAGE OF FARM CROPS.

The great majority of the returns state that there are no marked changes in the acreage of farm crops and no new enterprises in the line of agriculture. The returns indicate, however, that there will be a slight increase in the acreage of corn and a greater one in that of potatoes. Small fruits, especially strawberries, are yearly receiving more attention, and poultry culture is also rather increasing.

NOTES OF CORRESPONDENTS.

(Returned to us May 23.)

BERKSHIRE COUNTY.

Sheffield (DWIGHT ANDREWS). — The season is fully an average one, agriculturally speaking. Pastures and mowings promise well and fall seeding wintered well. The fruit bloom is a full average. Few practise spraying, but it is on the increase. Farm help is scarce and about one-fourth is good help. Wages range from \$18 to \$32 per month. There is no marked change in the acreage of the usual farm crops.

Alford (L. T. OSBORNE). — The season is about an average one. Pastures and mowing are now very promising. The fruit bloom is above the average. There are no insects doing damage except tent caterpillars, which are more plenty than usual. Spraying is but little practised against insects attacking fruit. Farm help is scarce and good help is hard to get. Wages are about \$20 per month with board. The acreage of farm crops is about the same as usual. Planting and sowing are about a week behind the average season, on account of wet weather.

Tyringham (G. F. KOPP). — The season has been wet thus far and is late. Fall seeding wintered well and pastures and mowings are looking well. The fruit bloom is very poor. Spraying is not practised to any extent. Farm help is plenty here, but our farmers hire as little as possible. Wages are \$18 to \$20 per month with board and \$1 to \$1.25 per day without board. There are no new enterprises in the line of agriculture. Our tobacco growers are at a standstill. The prices have been so low that many are going out of the business.

Lenox (ALEX. MCCONACHE). — The season is at present rather a good one. Pastures and mowings look well and fall seeding did very well. Fruit trees bloomed finely. Tent caterpillars are doing some damage. I am afraid that spraying against insects is on the decrease. Farm help is plenty and about half of it is good. Wages are \$25 per month with board and \$40 to \$45 per month without board. There is little or no change in the acreage of the usual farm crops. The ground has been cold and wet up to the past week, but things are starting well now.

Cheshire (L. J. NORTHUP).—Owing to the frequent rains, the season compares favorably with a normal one. Pastures and mowings are above the normal. The fruit bloom promises equally well with former years. Tent caterpillars promise to be very plenty. Spraying is not practised in this vicinity to any extent. Farm help is very scarce; probably a third of it may be good help. Wages are \$20 per month with board and about \$30 without. I do not see any marked change in the line of agriculture.

Florida (E. D. RICE).—The season is about a normal one. Pastures and mowings look well, owing to the wet April and May. Cherries and pears made a full bloom; not many plums; apples promise a good bloom. No insects have appeared as yet. Spraying for fruit is not practised to speak of. There is enough cheap help, but not more than 30 per cent of it is good. Wages are from 75 cents to \$1 per day with board and from \$1.25 to \$1.50 without. Our agriculture is about the same routine, with nothing new.

FRANKLIN COUNTY.

Charlemont (H. S. GILES).—The present season is in advance of the normal. Pastures and mowings promise very well and fall seeding wintered well. The fruit bloom was a good average. No insects have appeared as yet. Spraying is not practised, to my knowledge. Farm help is not plenty, but four-fifths of that available is good help. Wages are \$15 to \$20 per month with board and \$1.25 to \$1.50 per day without board. Some of our farmers are cultivating onions as a paying crop.

Leyden (U. T. DARLING).—The season compares favorably with a normal one. Pastures and mowings are looking well and fall seeding wintered well. Apples bloomed fuller than last year and peaches made an average bloom. No insects have appeared as yet. Spraying is but little practised, but more will be done in the future. Farm help is sufficient for the demand and nine-tenths of it is good help. Wages are \$15 to \$20 per month with board and \$1.50 per day without board. The acreage of corn planted will be increased; other crops about as usual.

Ashfield (CHAS. HOWES).—Grass is forward, but the wet weather has kept ploughing and planting back. Pastures and mowings are looking finely and fall seeding wintered extra well. Fruit trees of all kinds are blooming very full. Very few insects as yet. Farm help is quite plenty and generally very good. Wages are \$20 per month with board and \$1.50 per day without board. Grass and ensilage corn are our principal crops and dairying our principal business. The sheep industry is rather on the increase.

Whately (FRANK DICKINSON).—The season is at least one week behind the normal. Pastures and mowings are looking finely and fall seeding is looking well. The fruit bloom is above the average. The weather being cold and wet, we have very few insects. Spraying is practised very little if at all. There is a medium supply of farm help and not over one-fourth of it is good help. There will be very little change in the acreage of any leading crop.

Sunderland (J. M. J. LEGATE).—The season is a week later than the normal for everything except grass. Pastures and mowings are looking well and a good hay crop seems assured; fall seeding came through in good shape. There was a heavy bloom on all fruit trees except peaches, which had no blossoms. No insects as yet. There is no spraying done here. Farm help is very plenty and I should say three-fourths of it would be called good help. Wages are usually from \$13 to \$18 per month with board and \$1 to \$1.25 per day without board. The only change in the acreage of farm crops to be noted is a possible slight increase in the acreage of onions, but they have come up poorly and the crop will probably be no larger than usual.

New Salem (DANIEL BALLARD).—The season is a fair average one. Pastures and mowing are very promising and fall seeding wintered well. Apples, pears and peaches are coming out with quite a full bloom. Insects have not done much damage as yet. Not much spraying is done, but it is increasing gradually. Farm help is not plenty; probably half of it is good help. Wages are from \$10 to \$20 per month with board. There is no marked change in the acreage of farm crops and no new enterprises. Spring planting has been delayed by stormy weather.

Wendell (N. D. PLUMB).—The season compares favorably with normal years. Pastures are very forward for the season and fall seeding wintered well. Fruit trees are just begining to blossom and promise a good crop. No insects as yet. Spraying is not practised at all. Farm help is plenty and about half is good help. Wages are \$1.50 per day without board and from \$16 to \$20 per month with board. There are no changes in the acreage of the usual farm crops.

HAMPSHIRE COUNTY.

Greenwich (WM. S. DOUGLAS).—The season compares fairly well with a normal one. Pastures and mowings promise well and fall seeding wintered well. There is a very good fruit bloom. Tent caterpillars are doing some damage. Spraying is not practised at all, to my knowledge. Wages for farm help range from \$20 per month with board upwards and none of it is any too good.

There is no marked change in the acreage of the usual farm crops and no new enterprises.

Amherst (WM. P. BROOKS). — The season is about a normal one on the whole, except that the wet weather has put work a little behind. Pastures and mowings never promised better and fall seeding wintered well. There was an abundant fruit bloom, and peaches, cherries, pears and apples all promise well. Tent caterpillars are doing some damage. Spraying is practised by a few, but there is not much increase. Help is plenty, mostly foreign and green, but willing. Wages average about \$1.50 per day without board; board estimated at from \$12 to \$17 per month. The practice of dry green sprouting potatoes is becoming quite common, and consequently there are some crops which are very far advanced.

Hudley (H. C. RUSSELL). — The season is very much later than usual, owing to the cold April, and planting is late. Pastures and mowings promise well and fall seeding wintered well. There is a very full fruit bloom, especially for apples. There is not much damage from insects as yet. Spraying is but very little practised. Farm help is plenty and three-fourths of it is good help. Wages are \$15 to \$17 per month with board and \$1.25 per day without board. There is a slight increase in the acreage of onions and potatoes.

Southampton (C. B. LYMAN). — The season is fully up to the average, but the wet weather has delayed farm work very much. Pastures and mowings are above the average and fall seeding wintered fairly well. I think there was never so large a fruit bloom. Insects not doing much damage as yet. Farm help has been plenty and about two-thirds is good help. Wages are from \$16 to \$20 per month with board and \$1.25 to \$1.50 per day without board. There is no marked change in the acreage of farm crops.

Goshen (ALVAN BARRUS). — The weather has been excellent for mowings and pasture lands, but too wet for tillage, and the season is late. Fall seeding came through all right. The fruit bloom is late but otherwise promises about average. Insects have not yet appeared, probably because of the cold, wet weather. Spraying has been but little practised. Help is scarce and poor, but plenty enough unless it is better. Wages are \$18 to \$20 per month with board and \$1.50 per day without board. There are no particular changes in the acreage of farm crops and no new enterprises in agriculture.

Middlefield (J. T. BRYAN). — The present season is about ten days later than the normal owing to wet weather. Pastures and mowings are in excellent condition and fall seeding wintered well.

The fruit bloom was a good average. No damage from insects reported as yet. Spraying is not much practised. There is plenty of good help. Wages are \$20 per month and board. There is a slight increase in the acreage of corn and grain.

HAMPDEN COUNTY.

Chester (P. M. ADZIMA). — The present season is about an average one. Pastures and mowings are looking well and fall seeding wintered well. The fruit bloom is a little above the average. Potato bugs are doing some damage. Spraying is but little practised. Farm help is plenty and one in ten good help. Wages average \$1.50 per day without board and \$20 per month with board. There are no particular changes in the acreage of the usual farm crops.

Tolland (E. M. MOORE). — The present season is about an average one, agriculturally speaking. Feed is plenty in pastures, meadows are looking finely and fall seeding wintered well. Apple and pear trees are loaded with blossoms. Spraying is not practised to any extent. Farm help is scarce and about ten per cent might be called good help. Wages paid are \$15 to \$20 per month with board and \$1.25 to \$1.50 per day without board. About the usual acreage of farm crops will be planted.

West Springfield (J. N. BAGG). — The season is backward, the nights being cool and the ground moist. Pastures and mowings are in good condition. The fruit bloom is a fair average one. No insects have appeared as yet. Spraying is practised but very little. Farm help is plenty, and the Polanders have improved so that they are now considered good help. A good many work for \$1 per day and board themselves. There are no changes in the acreage of the usual farm crops.

Wilbraham (F. E. CLARK). — April and May have been cold and wet and we are a little backward in getting in spring crops. Pastures and mowings are looking well; early seeding is looking well, but late fall seeding is slow in starting and weeds predominate. There was a full fruit bloom. Not much damage from insects as yet. Poor help is plenty, good help scarce. Wages are from \$12 to \$20 per month with board and \$1.25 to \$1.50 per day without board. The acreage of corn and potatoes is higher than usual.

Pulmer (O. P. ALLEN). — The season compares favorably with a normal one. Pastures and mowing promise well and I think fall seeding wintered well. The fruit bloom is unusually fine. Few insects are in evidence as yet. Spraying is not practised to any

great extent. There is about the usual supply of farm help. Wages average about \$1.50 per day without board. There are no marked changes in the acreage of farm crops and no new enterprises.

Wales (C. F. CRAWFORD). — I think the season promises well. Pastures and mowing are in good condition and fall seeding looks fairly well. Fruit has made an average bloom, but some apple trees are not full. No insects have appeared as yet. Spraying is very little practised, but is increasing somewhat. Hired help is very scarce and perhaps half of it is good. Wages are about \$18 per month and \$1 per day with board and \$1.50 per day without board. There are no changes of any account in the acreage of farm crops and no new enterprises.

WORCESTER COUNTY.

Southbridge (G. L. CLEMENCE). — The season is a little backward. Pastures and mowings are in good condition and fall seeding wintered well. Apples made a very full bloom, pears medium. But little spraying is done about here. Good help is very scarce. Wages are \$22 to \$25 per month with board and \$1.25 to \$1.50 per day without board.

North Brookfield (J. H. LANE). — The season is two weeks late as to sowing and planting corn. Pastures are late, stock being kept in the barn two weeks later than usual. The fruit bloom is fuller than usual all around. No insects as yet. Very little spraying is done. Farm help is plenty and 10 per cent is good help. Wages are from \$12 to \$20 per month with board. There is a shortage in stock, and pasturage is consequently offered much lower than usual.

Rutland (L. S. DUDLEY). — The present season compares well with the normal. Pasturage, mowings and new seeding all look finely. The fruit bloom is way ahead of most years. Tent caterpillars are doing some damage. Spraying is not practised. Help is plenty, but only about one in ten is any good. Wages are from \$15 to \$18 per month with board and \$30 without. There are no marked changes in acreage of farm crops and no new enterprises.

Dana (E. A. ALBEE). — The season is fully up to the normal. Grass has started well and is now looking well. The fruit bloom is about the average of bearing years. Tent caterpillars are doing some damage. There is no spraying done in this locality. Help is scarce and not over one-fourth of it is good help. Wages with board range from \$15 to \$20 per month; without board, \$1.50 per day. There will be a larger acreage of potatoes than usual and more strawberries are set than ever before.

Royalston (C. A. STIMSON). — The present season is up to the average, except slightly colder. The promise for pastures and mowings is exceptionally good and fall seeding wintered well. The fruit bloom is above the average. No insects as yet. No spraying is done in this locality. Good help is always scarce and is not more than one-eighth of the total supply. Wages are \$16 per month with board; most day help is paid \$1.50 per day. No marked changes in acreage of farm crops and no new enterprises in agriculture.

Westminster (I. DICKINSON). — The season is very favorable, but planting is late. Pastures and mowings are in the best condition and fall seeding wintered well. Fruit trees made a full bloom and are looking finely. Tent caterpillars are doing some damage. Very little spraying is done and the practice is not increasing. Good help is scarce, being about 10 per cent of the supply. Wages are from \$18 to \$20 per month with board and \$30 without. Acreage of farm crops about as usual and no new enterprises.

Fitchburg (JABEZ FISHER). — It has been a little wet for some lands, but otherwise the season is normal, and apple trees bloomed one day earlier than the average for forty-two years. Pastures and mowings are in first-class shape; no winter-killing seen. The fruit bloom was unusually superior for most fruits. Tent caterpillars and bud worms are doing some damage. Very little spraying is done, and it is not generally increasing. Poor help is plenty, as usual; good help, less so. Wages are \$20 per month with board and \$1.50 per day without board. No special changes are likely to be made in crops.

Bolton (H. E. BABCOCK). — The season is from ten days to two weeks late. Pastures and mowings promise well and fall seeding wintered well. Apples, pears and cherries blossomed very full; plums and peaches look badly. No insects doing damage as yet. There was more spraying than usual last year, but none as yet this year. Good farm help is scarce. Wages are from \$1 to \$1.25 per day with board. The acreage of farm crops is slightly reduced in this vicinity.

Worcester (S. A. BURGESS). — The season is about a normal one. The prospect for pastures and mowings is quite favorable and fall seeding wintered well. The fruit bloom is average, except that Baldwin apples are not up to the average of even years. Canker worms, tent caterpillars, cut worms and white grubs are doing some damage. Spraying is quite generally practised and is increasing. Farm help is quite plenty and about half of it is good. Wages are \$15 to \$25 per month with board, \$25 to \$50 per month

and \$1 to \$1.50 per day without board. There is an increase in the acreage of potatoes.

Sutton (O. P. JOHNSON). — The season is from ten days to two weeks late. The promise for pastures and mowing is good and fall seeding wintered fairly well. The fruit bloom compares very favorably with the normal. No insects doing damage as yet. Very little spraying is done, but I think it will increase. Wages are from \$12 to \$20 per month with board and \$25 to \$36 without. No changes in the acreage of farm crops are apparent as yet.

Northbridge (H. A. COOK). — The season is about two weeks late. Pastures and mowings are looking finely and fall seeding wintered well. The fruit bloom is fully up to the average of bearing years. Tent caterpillars are doing some damage. Very little is done in spraying except on small fruits. Farm help is very scarce and it is almost impossible to get good help. Help is hired mostly by the day without board, at from \$1.25 to \$1.33 per day of ten hours. The same old ruts are followed and there are no new enterprises.

MIDDLESEX COUNTY.

Hopkinton (W. V. THOMPSON). — Pastures and mowings promise well and fall seeding wintered well. Fruit trees made a full bloom. Canker worms are doing some damage. A few have sprayed their fruit trees. There is not much farm help hired in this locality. There are no marked changes in the acreage of farm crops and I know of no new enterprises in agriculture.

Marlborough (E. D. HOWE). — The season is fully up to the normal. Pastures and mowings look well and fall seeding promises well. The fruit bloom is equal to that of two years ago. Tent caterpillars are doing a little damage. About one-fourth of our farmers spray their fruit trees, but there is no great increase. Help is quite plenty and about one-fourth of it is good. Twenty-five dollars per month and \$1.75 per day are the highest wages paid. There are no marked changes in acreage of farm crops and no new enterprises.

Maynard (L. H. MAYNARD). — The season compares favorably with the normal. Pastures and mowings promise well and fall seeding wintered well. The fruit bloom looks nearly as well as in 1896. Tent caterpillars and currant worms are doing some damage. I have not heard of any spraying so far this season. Farm help is plenty, mostly Swedes and Danes, and is fairly good help. Wages are from \$15 to \$20 per month with board, day labor from \$1 to \$1.25. No new enterprises nor any marked change in acreage of crops.

Townsend (G. A. WILDER). — The season is above the average. Pastures and mowings are in extra good condition and fall seeding wintered well. The fruit bloom is better than the average. Tent caterpillars are doing some damage. Spraying is not generally practised, but is on the increase. Help is plenty and 85 per cent. of it is good. Wages are from \$15 to \$20 per month with board and \$1.25 per day without board.

Dunstable (A. J. GILSON). — The season is somewhat late, on account of cool and wet weather. Pastures and mowings are in good condition and fall seeding wintered well. The fruit bloom is generally heavy and nearly equals that of 1896. Some tent caterpillars made their appearance very early, but soon disappeared. Very little spraying is done and it does not seem to increase. Farm help is about equal to the demand and very good. There are no changes in the acreage of crops to note and no new enterprises in the line of agriculture.

Bedford (HENRY WOOD). — Crops are backward for the time of year. Pastures and mowings are in good condition and fall seeding wintered well. The fruit bloom was very full. There are no insects doing damage as yet. I think spraying is on the increase in this locality, but have seen none done as yet this year. Farm help is plenty and about half of it good. Wages are from \$18 to \$20 per month with board and from \$40 to \$45 without. I think the acreage of farm crops is less than usual.

Woburn (W. H. BARTLETT). — The season is later than usual at this date. Pastures and mowings are in very good shape and fall seeding is all right. No plum bloom, apples about two-thirds full, pears full, not many peaches. There are fewer caterpillars so far than usual. Spraying is practised and is increasing. Very few are asking for work and good help is very scarce. Wages are \$1.50 per day without board; very few board help in this vicinity. I note no new enterprises in agriculture, unless it is a tendency to sell cream instead of milk, which is being tried somewhat.

Stoneham (J. E. WILEY). — The season compares favorably with the normal. Pastures and mowings are in fine condition and fall seeding wintered well. The fruit bloom is fully up to the average. Currant worms are the only insects doing damage as yet. Spraying is on the increase. Farm help is plenty and about one-fourth of it is good help. The average wages with board are \$18 per month and without board \$35. There is no marked change in acreage of farm crops and I note nothing new in agriculture.

ESSEX COUNTY.

Amesbury (F. W. SARGENT). — An excess of cold rains has delayed planting so that everything now comes together. Pastures

and mowings are in splendid condition and fall seeding wintered well. Apples made a full bloom, pears moderate. Tent caterpillars and asparagus beetles are doing some damage. A majority of farmers spray some, but few do it thoroughly. Help is plenty and one man in ten is good. Wages are from \$15 to \$22 per month with board and from \$1 to 1.50 per day without board. There is a slightly increased acreage of potatoes.

Newbury (G. W. ADAMS). — The season compares well with a normal one. The promise for pastures and mowings is good and fall seeding wintered well. The fruit bloom is above the average. Tent caterpillars are doing some damage. About half of our farmers spray and the practice is increasing. Help is fairly plenty and 5 per cent of it is good. Wages are from \$15 to \$25 per month with board and \$1.50 per day without. There is an increase in the acreage of potatoes.

Ipswich (O. C. SMITH). — The season is about normal. There will be good feed in the pastures and a large crop of hay, if rain is plenty. The fruit bloom is somewhat above the average. No insects except tent caterpillars have appeared as yet. All do not spray, but the practice is increasing. We have all the help wanted and 80 per cent are fairly good. Wages are \$20 to \$25 per month with board and \$1.50 to \$2 per day without board.

Topsfield (B. P. PIKE). — The season is as good as the average. Pastures and mowings are now very promising. Apples made a very full bloom, pears fair, peaches medium. No insects are doing much damage as yet. No spraying has been done as yet, but considerable will be done later. Farm help is not plenty and not over 10 per cent of it is good. Wages are from \$15 to \$20 per month with board and \$1.50 per day without board. The acreage devoted to potatoes is somewhat increased.

Danvers (C. H. PRESTON). — The season is a little backward. Pastures and mowings show good promise and fall seeding wintered well. There is a large bloom on apple trees, especially greenings and russets. Tent caterpillars are doing some damage. Spraying is not nearly general enough but is increasing. Farm help is plenty. Wages are from \$18 to \$21 per month with board. There is no marked change in the acreage of farm crops and no new enterprises.

NORFOLK COUNTY.

Norwood (F. A. FALES). — The season is about two weeks late. Pastures and mowings are both below the average in condition, but fall seeding wintered well. The fruit bloom is 50 per cent above that of 1897. No insects are doing damage as yet. Spray-

ing is but very little practised here. Farm help is scarce and not more than one-quarter of it good. Wages are from \$16 to \$20 per month with board and \$1.65 per day without board. There is quite an increase in the acreage of potatoes planted.

Canton (E. V. KENNEDY). — Vegetation is a little earlier than usual and seeds are germinating well. Pastures promise well; young stock all out; grass excellent; nothing winter-killed. All fruit trees are unusually full of blossoms. A few tent caterpillars have appeared, but no other insects. Spraying has not been practised much, but is increasing. Good farm help is scarce, not more than one-eighth of the supply; always enough of the other kind. Wages are \$15 to \$22 per month with board and \$1.25 to \$1.50 per day without board. The acreage of potatoes will be increased. The breeding of swine will be discontinued to a great extent in this section, owing to the change in the manner of disposing of the house offal by the city of Boston.

Acron (S. F. OLIVER). — The season is at present a backward one. Pastures and mowings are in good condition and fall seeding wintered well. Apples of all kinds bloomed very full. No insects doing damage as yet. Spraying is not practised to any extent except on small trees and shrubs. Farm help is plenty, but a small proportion only is really good help. Wages are from \$15 to \$20 per month with board and about \$9 per week without board. There will be a larger acreage of grass land this year than ever before. There appears to be a larger movement among the farmers in this vicinity to put in crops for green fodder.

Millis (E. F. RICHARDSON). — The season is late at present. Pastures are looking well and fall seeding wintered well. The fruit bloom is very large. No injurious insects have appeared as yet. There was a great deal of spraying done last year; none done as yet this year, owing to the non-appearance of canker worms. Farm help is plenty, but the proportion of good help is very small. Wages are from \$16 to \$20 per month with board. Farmers are raising more hay and fewer cultivated crops.

Franklin (C. M. ALLEN). — The present season is about an average one. Pastures, mowings and fall seeding are all in fine condition. Nearly all fruit trees have bloomed full. I have noticed but little damage from insects. Perhaps half our fruit trees are sprayed and it is on the increase. Farm help is plenty and 10 per cent is good help. Wages average about \$18 per month with board. No changes in the acreage of farm crops and no new enterprises.

BRISTOL COUNTY.

Easton (H. M. THOMPSON). — The season is backward, but will probably catch up if weather conditions are favorable. Pastures and mowings are in excellent condition and fall seeding wintered well. The fruit bloom is much better than last year and promises a heavy yield. No insects as yet. The amount of spraying done is very limited. Help is plenty and about one-fourth of it is good help. Wages are about \$15 per month with board and about \$30 without. The acreage of farm crops will average about as usual.

Raynham (N. W. SHAW). — Nearly everything is later than usual. Mowings look well, but much fall seeding winter-killed. The fruit bloom is not quite up to the regular fruit-year average. Currant worms are doing some damage. Spraying is practised but little, but is on the increase. Farm help is plenty and one-fourth is good help. Wages are \$25 and \$30 per month without board. The continual heavy rains in the early part of the season have beaten the ground down so hard that it is difficult to make it mellow enough to produce a good crop.

Dighton (J. N. PAUL). — The season is backward and very cold and wet. Pastures and mowings are in good condition and fall seeding wintered well. There is a good fruit bloom. No insects at present. Spraying is practised quite extensively and is on the increase. Farm help is plenty. Wages are from \$12 to \$20 per month with board and \$1.25 per day without board. No marked change in the acreage of farm crops. Strawberry beds wintered well, are looking well, and the prospect is good for a large crop, but it will be late.

Dartmouth (L. T. DAVIS). — The season is a little later than the normal. Pastures and mowings promise well and fall seeding is very good. The fruit bloom is very much better than last year and a good crop is promised. Very little damage from insects as yet. There is about the usual supply of help. Wages are from \$12 to \$20 per month with board and \$1 to \$1.50 per day without. No changes in the acreage of farm crops worth considering.

Acushnet (M. S. DOUGLAS). — The season is rather backward, Pastures and mowings are in good condition and fall seeding wintered well. The fruit bloom was very good, much better than last year. We have been very free from insects thus far. Spraying is not practised here. Farm help is plenty, but there is very little first-class help. Wages are \$20 per month with board and \$1.50 per day without. There are no marked changes in the acreage of farm crops.

PLYMOUTH COUNTY.

Brockton (DAVIS COPELAND). — The season is about two weeks late. The promise for pastures and mowings is good and fall seeding wintered well. The fruit bloom is above the average. Have noticed no damage from insects. Spraying is not practised to any extent. Farm help is plenty, but not more than 10 per cent of it is good. Wages are from \$10 to \$25 per month with board and from \$6 to \$10 per week without board. There are no marked changes in the acreage of farm crops.

Hingham (AARON LOW). — The weather has been cold, with but little clear sunshine. Pastures and mowings are very forward. The bloom on apples and plums was heavy. No insects have appeared as yet. Spraying is not much practiced, but is on the increase. Help is scarce, and that available is unreliable. Wages are \$15 per month with board and \$30 to \$35 without. There are no marked changes in the acreage of the usual farm crops.

Marshfield (J. H. BOURNE). — The season is a few days behind the normal for this date. Pastures and mowings are in excellent condition; fall seeding looks well, excepting in a few low places. The fruit bloom is very full. The tent caterpillar is getting ready for business, but it is a little early for insects. Only a few spray their fruit trees. Help is plenty and half of it is good. Wages are \$15 to \$20 per month with board and \$30 to \$35 without. There are no changes in the acreage of farm crops and no new enterprises in agriculture.

Bridgewater (ROWLAND CASS). — Although the early part of the season was wet and cold, I think it is about normal now. Pastures and mowings are in good condition and fall seeding wintered well. Apple trees bloomed full; other trees not as full as usual. Insects have been held in check by the cold, but there are some cut worms and tent caterpillars. Spraying is not practised. Farm help is plenty and of average quality. Wages are \$18 per month with board and \$1.50 per day without board. There is an increased acreage of potatoes and corn. Some apple and peach trees have been set out.

Kingston (J. H. CUSHMAN). — The season is now about two weeks late. Pasturing is looking well. All trees bloomed well, with the exception of Baldwin apples, which are scarce. But little complaint of insects as yet. I hear of no spraying being done. There is help enough and one out of ten is good help.

Carver (J. A. VAUGHAN). — On the whole, the season is an average one, although the spring has been rather cold and wet. Pastures and mowings are in good condition and fall seeding

wintered well. The fruit bloom is about an average one. A few tent caterpillars have appeared. Spraying is practised to only a small extent, but is increasing. Farm help is plenty and perhaps half of it is good. Wages are \$1.50 per day of nine hours without board. More potatoes are planted than usual.

BARNSTABLE COUNTY.

Falmouth (D. R. WICKS). — Taken as a whole, the season is about a normal one. Pastures are in fine condition, mowings never better, and fall seeding came through all right. Peaches never bloomed more fully, other stone fruits full, apples look promising, pears fair. Potato bugs are doing some damage. Spraying not practised yet, but should be. Help is very scarce and half that available is good. Wages range from \$1.50 to \$1.75 per day without board. The acreage of potatoes is increased about 20 per cent.

Sandwich (J. R. HOLWAY). — The season is very wet and late. Pastures and mowings are in very good condition and fall seeding wintered well. The fruit bloom was heavier than for a number of years. But few insects have appeared as yet. Considerable spraying has been done and it is on the increase. There is all the help that is needed and most of it is fair help. Wages are from \$12 to \$20 per month with board and \$1.50 per day without. The acreage of potatoes is much larger than usual, other crops about the same.

Barnstable (JOHN BURSLEY). — The season is now a few days late. Pastures and mowings are in good condition and fall seeding looks well. The fruit bloom was late and light. Tent caterpillars are doing some damage. Very little spraying is done and there is no increase. Help is scarce and half of it is good help. Wages are \$20 to \$25 per month with board and \$1.50 per day without board. There are no marked changes in the acreage of farm crops and no new enterprises in agriculture.

Dennis (JOSHUA CROWELL). — The season is about a normal one. Pastures and mowings are in very good condition and fall seeding wintered very well. The fruit bloom is better than last year, but is not quite up to the average. Very few insects as yet. The practice of spraying is increasing. Help is not very plenty just now and about half of it is good help. Wages are \$1.50 per day and \$30 to \$35 per month without board. Garden and field crops are backward and planting has been deferred owing to cold and wet weather.

Brewster (J. H. CLARKE). — The season is a little backward, except for grass. Pastures and mowings are in very good condition and fall seeding wintered well. The fruit bloom is fully up to the average. No insects to any extent as yet. Very little spraying is done except on cranberry bogs. Plenty of help and three-fourths of it is good. Wages are 15 cents per hour without board; very little hired with board. There are no marked changes in the acreage of farm crops and no new enterprises in agriculture.

DUKES COUNTY.

West Tisbury (GEO. HUNT LUCE). — The season is much later than the normal. Pastures and mowings promise better than usual. The fruit bloom is later than usual. No insects are doing damage at present. Spraying is practised to a small extent and does not increase much. Farm help is about equal to the demand and about one in ten is good help. Wages are \$1.50 per day without board and \$10 to \$25 per month with board. There are no marked changes in acreage of farm crops nor any new enterprises in agriculture.

NANTUCKET COUNTY.

Nantucket (C. W. GARDNER). — The season is late, on account of so much rain and cool weather. Pastures and mowings look finely and fall seeding wintered well. The fruit bloom is more abundant than usual. Potato bugs are doing some damage. Most of our farmers get green Portuguese for help. They are good workers and no eye-servants, but at first cannot understand English. Wages are \$10 to \$15 per month with board and \$1.50 per day without board. The acreage planted to potatoes is larger than for many years.

BULLETIN OF MASSACHUSETTS BOARD OF AGRICULTURE.

NATURE'S FORESTERS.

By E. H. FORBUSH, *Ornithologist to the Board.*

Who can tell us of the beginning of vegetation upon the earth, of the evolution of the forest from the rank growths of the swamps of early periods? Who can even write the story of the forests of to-day, from the seed sowing through the cycles of years to the tottering and fall of the last giant trunk as it goes crashing to the forest floor to crumble in dust amid the fragments of its fellows? How is the forest planted? Somewhat of this we know. Wind, stream and wave are the bearers of the seed; crow, jay, thrush, mouse and squirrel are the forest planters. But, say you, the trees bear fruit, and if the seed fall on good ground, the rains will come, the sun will shine and the seed will spring up and bear fruit according to its kind. True, but if acorns fell to the ground only beneath the oak, there would be no wider dissemination of the seed than could be thus accounted for, and we know that oaks spring up as if the seed were sown broadcast. Let us watch the sowers of the seed, and so learn how it is scattered broadcast over the land.

PLANTING THE FOREST.

If you will take a white pine cone with seeds, break it open and examine a seed, you will find that it is enveloped in a membrane with a wing-like appendage. Now take the seed and toss it into the air, and it will descend to the ground with a rotary motion, like that of a pickerel spoon when drawn through the water. As the seed descends, its wing by this rotary motion forms a spiral plane at an angle with the direction of its descent, serving as a parachute to sustain it in the air. If there is the slightest breeze, the seed floats off upon it and descends diagonally to the ground. The phenomenon is much the same as that observed in the fall of seeds of the ash and some other deciduous trees. Such seeds, like the pine seed, are winged for distribution. Although they will

not float on the gentle breeze like thistle or dandelion seeds, still in a strong wind they are carried quite a distance, fifteen or twenty rods, possibly farther. When the seeds fall to the ground they soon separate from their wings. A heavy rain or the foot of some animal may bury them, or falling leaves may cover them, and the planting is done. If they fall upon the surface of a lake, the gentle breeze wafts them along over the surface like a fleet of little boats to islands or distant shores; should they fall upon a stream, they float away with the current. Although the seeds of many forest trees do not grow their own wings, we find them as widely distributed as the seeds of the pine. Nuts and acorns are furnished with transportation by the wings or legs of animals that feed upon them.

Notice the distribution of the wild cherry along the roadsides. In the spring you see here and there on cherry bushes or trees the webs of the tent caterpillar. They are usually found upon the apple and wild cherry, and if you search the woods and fields, along the walls between pastures and on bushy hillsides, you may, perhaps, be surprised to find caterpillar "tents" everywhere, and usually on some species of wild cherry. The wild cherries are scattered all through the woods, where the birds, feeding upon the fruit, drop the stones as they fly. It is a rule of nature that the destroyer of the fruit is also the distributor of the seed.

The other day I noticed a young pine growing some ten feet from the ground in the fork of a maple tree by the roadside. Who planted it there? Years ago I watched the squirrels in the great forests of the Pacific slope. They worked in pairs. One squirrel climbing the giant trees, cut off and threw down the cones, doing this so rapidly that two or three were sometimes in the air together on their way down, the last having been detached before the first reached the ground. The other squirrel, biding at the foot of the tree, carried off the cones as they fell. No doubt some of the cones were left on the ground where they fell; but most of them were carried to a distance and hidden away in the earth-mould or in the squirrels' storeroom. High in the trees the busy, garrulous jays pottered about among the branches. Here on the Atlantic coast squirrels and jays, though of different species, have for ages buried their food in the same way.

In the autumn of 1897 the mast crop was light in some sections of eastern Massachusetts, but here and there an oak tree was found which bore a good crop. Such trees were soon discovered by the jays and squirrels, several of which might be seen gathering the acorns from each tree. The ground squirrels work in pairs,

as do the squirrels of the Pacific coast, one climbing the tree and throwing down the acorns to the other.

The jays alight in the tree top, each jay breaking off an acorn with his feet, sometimes hammering it open with his beak and eating it on the spot, or carrying it off to some hiding place; sometimes dropping it from the tree or while flying, apparently for no purpose except to hear it strike the earth.

Have you ever noticed what a mania jays, crows and squirrels have for distributing and hiding things? One whose childhood has been spent in the country will recall an old shellbark hickory by the cottage door, with the crevices of its ragged bark ornamented with walnuts, tucked in here and there all over the trunk. Any one watching the jays and squirrels in the fall will find them filling crevices, dropping nuts, acorns, corn and other things into cavities and hollows in the trees, or burying them in the leaf-mould on the ground.

I once watched a crow killing a large, brightly colored beetle, probably *Calosoma scrutator*, which he carefully buried beneath a tuft of grass. Returning a few moments later he unearthed the creature, carried it away and buried it in another place. In a pine wood in Medford, on April 16, 1897, several crows flew from the ground. Here under the pines an interrupted feast was found. Crows, jays or squirrels had been digging out stores of acorns which had probably been buried there the previous fall. The interrupted diggers had left six acorns dug from one hole. Others were partly unearthed.

It is said that squirrels bite off the germ ends of the acorns before burying them. This habit has never come under my observation. These acorns not only had their germ ends intact, but seven of them had sprouted. One had sent the tap root down four inches into the mould. They had been carefully set with the points downward, as nicely as it could have been done by a man. They were deeply covered with light mould and pine needles. Some of the digging looked like the work of squirrels, but marks on some of the acorns were apparently made by the beak of a bird. A gray squirrel was seen near by. Had his feast been interrupted by the crows or had all been at work together? How does the crow know that the acorns lie buried just there? Does he remember that he planted them? Does he find them by scent? Has he seen the disturbance of the pine needles, caused by the young sprout? Or has he watched the squirrel, and descended to rob it of its stores? Who is wise enough to interpret the workings of a crow's mind? Who can tell how far its perceptive faculties will serve, or mark the boundary between instinct and reason? You

may say these creatures had been merely storing up food against a season of want, and that is true, but it is only half the truth. It is true also that many of the seeds which are hidden by the squirrels are never found by them again. There is an immense amount of vitality in these creatures, which must be expended in some way. When the red squirrel is not eating or providing food for himself, or getting into some abominable mischief, he is scolding or chattering in profane squirrel language at some intruder, or busy burying or digging something up. We know that the duck-hawk slays when it has no appetite, and leaves its victims where they fall; that the shrike impales many victims which it does not eat, thus furnishing winter food for jays and titmice. If rapacious birds slay for the joy of killing, no doubt the squirrel plants for the joy of planting. At any rate, in thus planting it fulfils one of the purposes of its existence. The squirrel makes his journeys back and forth, burying the acorns and hickory nuts in secret places. One day, however, as he is going his accustomed path up the walnut tree, a hawk swoops down and gathers the squirrel to his fathers. That squirrel has stored up for future use a supply of food which he will never gather. As Thoreau says, he is "planting a hickory wood for all creation."

Even the wood mice are given to such tricks. While living, one winter, in the woods, four children had stored in the house several quarts of chestnuts. These chestnuts would disappear mysteriously from their receptacles, and reappear in the most unique places. If on retiring at night one left his shoes upon the floor, in the morning he would find the toe stuffed with chestnuts. They were found deposited in various hiding places all about the house, and were moved from night to night, being carried from the ground floor to the attic and returned again. Single chestnuts, chestnuts by pairs, chestnuts by the dozen and by the score were transported and hidden in the most unlikely places throughout the building. A full quart of these chestnuts might be gathered in the morning from the various places in which they had been secreted during the night. There were no house mice or squirrels in the house, but by keeping a watch and setting a few mouse traps it was found that a small colony of deer mice had stolen the chestnuts and put them "in circulation." Here, then, we have a planter of chestnuts.

The birds and squirrels destroy a great part of the seed crop, but the trees produce a great surplus, and the wild creatures plant and leave to germinate an abundance of good seed. Thus the destroyer of the seed disseminates and perpetuates the very tree which furnishes its sustenance.

THE SUCCESSION OF FOREST TREES.

When you cut down an oak or chestnut wood, especially if it is old and heavy timber, a pine wood is likely to spring up in its place, particularly if there are pines near by; while, if you cut off a pine wood, it is usually succeeded by a wood composed mainly of deciduous trees, mostly hard woods, or the nut, cone or acorn bearing kinds. Such a succession of trees has long been considered by farmers to be the rule. In other words, in some way there comes rotation of crops when wood lots are cut off. It is believed by some to be due to the springing up of seed which has been buried for many years in the ground. When an oak wood springs up where a pine wood has been cut away, there is no doubt that it has sprung from seed in the ground. But it has not sprung from seed which has been buried for many years, but from seed buried probably within the year by birds and squirrels, and which has been given a new lease of life by the sun's rays let in by the removal of the dense foliage from above. All through the autumn months, when nuts and acorns are plentiful, jays, crows and squirrels are gathering and storing away the seed among the pines where they resort for shelter.

Thousands of crows will roost in a pine wood for months during the winter when the leaves are off the deciduous trees. The pines then offer the best hiding-places for all woodland creatures. In some of the large crow roosts among the pines extensive deposits of various seeds and other material are found. When a pine wood is surrounded on all sides by oak and walnut trees, when squirrels, jays and crows are plentiful and the trees bear well, great quantities of acorns and nuts will be carried by these creatures into the pine wood, and buried beneath the dead "needles" or hidden away in crevices. Although these nuts and acorns are buried in the mould during the fall, many of them are dug up in the winter months, especially by the red squirrel. But many are never found.

Note an opening in the pines made by cutting away a few trees. Here young oaks spring up, and we find oaks and walnuts in such openings quite as often as we find pines. Examine the ground under the pines in the summer, and you may find many little oak, walnut and maple trees coming up from beneath the pine needles, and you will also find here and there young pines. All these young trees soon die in the dense shade of the larger pines.*

* If the lot is not favorably situated and if birds and squirrels are not plentiful, and, above all, if the crop of mast has been light the year before, there may be no young walnuts and oaks springing up.

If the conditions are favorable when the pine wood is cut off, then the young, hard woods spring up and flourish. But why do not pines spring up where pines are cut off? First, pines do not sprout from the stump; next, there is not a regular crop of pine seed each year, so that when the pine wood is cut there may be no good seed in the ground. Again, young pines need some shade and protection, and if the larger trees are all cut down, many of the young pines may die when exposed to the sun. Those who, with a knowledge of this fact, plant pines on unshaded ground, especially in a season of drought, plant rye or some other cereal with the pines, so that the quickly growing grain may shade the young plants the first year. As we travel through the country we can usually see how the young pines are seeded down under favorable conditions. Many of the neglected pastures of the State are being clothed with pines. Note a group of large pines in a pasture. They were left, perhaps, when the woods were cut off there years ago. On the shady side of these are a few smaller trees, and beyond these others smaller still, and so on, the pines grading in size according to the distance from the parent trees, until at the limit of the plot there is an outer growth of little pines, perhaps only one, two or three years old. The seeds which blew first from the large pine and fell in its shade have germinated and flourished well, while many of those on its sunny or exposed side died. Now, let us see why pines appear where hard woods have been cut off. This kind of succession is not so common, as many of our hard-wood lots are cut for cord wood as soon the trees are of sufficient size. Sprouts shoot up from the stumps immediately on the opening of the season, choking many young pines. Yet some will flourish, and there is then a mixed growth of pines and hard-wood trees. This is the character of much of the wooded region near Boston. But if an oak or walnut wood is allowed to grow until the trees are old, and is cut when the roots have lost their vigor, sprouts, if they come up at all, are not so vigorous, and the pines have a better opportunity. Where squirrels are numerous, a considerable part of the fruitage of the pine is removed by them and the cones are buried or scattered about, not only among the pines, but among the hard woods. Watch the squirrels for proof of this statement. The winds also scatter pine seed far and wide, among deciduous trees. So, if there are pines near hard-wood lots, there are usually young pines among the hard-wood trees. When the hard woods are cut off, these young pines, having had a start in the shade, flourish and afford some shade for still younger seedlings, which quickly germinate from the seed

scattered through the lot. In some cases the cattle turned out to browse keep down the broad-leaved species and spare the pines. Thus the pine wood succeeds the oak.

PRUNING THE TREES.

If the young tree escapes or survives the assaults of its many enemies and grows lustily and vigorously, it is prone to an over-production of fruit or leaves. Orchardists and foresters practice pruning, and believe that when it is judiciously done it is good for the tree. In this practice they are right when they follow nature, and do not attempt to "improve" too much upon her methods. Nature has many ways of pruning. Superfluous buds are nipped off by birds, or destroyed by bud worms and other insects. When the sun lies warm in February and March on wooded hillsides the partridge (*Bonasa umbellus*) may be seen "budding" on the alders and birches. Neither is it a stranger in the orchard, for it is fond of the apple buds. In May the rose-breasted grosbeak (*Habia ludoviciana*) and the purple finch (*Carpodacus purpureus*) attack both buds and blossoms, scattering snowy petals far and wide. All trees have many so-called enemies which live upon them. There are said to be over five hundred different species of insects injurious to the oak.* Still we have oaks, for most of these insects when occurring in normal numbers are beneficial rather than injurious. Their interests are identical with those of the tree which supplies them with sustenance. A few caterpillars may be a benefit by removing surplus foliage, and thus checking a too vigorous development which otherwise might be injurious. Others, if not too numerous, may benefit by destroying the surplus fruit. Certain insects, as the oak pruner, cut off the twigs, others, like the imported leopard moth, destroy branches. In 1896, oak pruners (*Elaphidion villosum*) were numerous in eastern Massachusetts. They attacked several species of oaks, also hickories and maples. They also attacked the apple tree. Their occurrence in numbers seems to be periodical, and thus the trees are subject to a more or less regular periodical pruning. Large quantities of twigs and small branches fell from the oaks and other trees in 1896, and it ap-

* Packard says: "The number of determined species of oak insects recorded in the following pages is over four hundred, while the number of undetermined species would carry the number up to over five hundred, or about as many as Kaltenbach records for Germany. It is not improbable that ultimately the number of species of the United States will be between six hundred and eight hundred or even one thousand." (5th Rep. U. S. Ent. Com., 1886-90.)

peared as if the oak pruners might do considerable injury to these trees. But the trees are certainly not injured, and very likely in most cases they have been benefited by this removal of the twigs from the top branches. Since 1896 the oak pruners have been so well held in check by their natural enemies that they have not been conspicuous. When branches are injured by insects or over shading to such an extent that they die, they are removed (when weakened by decay) by the action of the wind, or are broken down by the collection of ice and snow upon them.

THE GUARDIANS OF THE FOREST.

If the insects and other creatures which feed upon the trees and their products were allowed by nature to increase unchecked, they would soon destroy all the forests from the face of the earth. Although when in normal numbers they may be a benefit to the trees, it is still true that, when abnormally numerous insects constitute a most serious danger to forests; therefore the creatures which feed upon insects and so hold them in check should be protected, as the guardians of the forest.

In the first warm days of early spring, when nature is roused from her winter sleep and the crude sap is coursing sluggishly through the branches, moving toward the unopened buds, slow-crawling reptiles and batrachians awaken from their winter sleep. From every pool and swamp in the forest is heard the croaking of the frogs. The little *Hyla* pipes its high treble, the flat baritone of the wood frogs swells the chorus, and from the margins of dark pools here and there the deep boom of an early bull-frog accentuates the chorus like a bass drum in an orchestra. As the buds burst and the little leaves begin to appear, the tree frogs leave the pools and ascend the trees. The larger species scale the trunks, sitting here and there like ugly excrecences on the trees, but unobserved because of their protective coloring, and feeding on insects which they find on the trunks and branches. The little squirrel tree frogs (*Hyla squarrela*), sticking to the limbs and twigs as flies stick to a wall, leap in bird-like flight among the branches, gathering tiny insects there. The wood frogs glean from the dead leaves on the ground and from the undergrowth their share of the tree's enemies, while at the edge of the wood our old friend the toad sits patiently at the foot of some huge tree in the early morning light, snapping up unfortunate caterpillars that descend the trunk.

With the opening of the leaves the insect hordes increase. Bark lice swarm on the trunks, plant lice appear on leaf, twig and stem.

As the warm days of spring revivify vegetation and the sap ascends the trunks and branches, the buds expand and open to the sunlight. The same warm sun which brings forth the leaflets stirs to life the embryos within the millions of insect eggs deposited among the trees, and even before the leaves have opened, hordes of tiny caterpillars are seeking every crevice in the buds.

A warm wind blows from the south, bringing new life to leaf and insect. Tiny perforations are now plainly seen, where each worm has gnawed bud or leaf. During the night swift wings are heard, with many a cry and chirp, as the birds come in on the warm south wind. And when the sun again appears, filling the woods with warm odors from the steaming ground, its rays light up a procession of beauty, for the migrants from the south have come. Thus come they always when the spring has prepared their food for them, and now the wood is alive with merry warblers, swinging actively from bough to bough and lightly pecking the tiny caterpillars and plant lice from their resting-places on the twigs and leaves. The birds pass on, destroying countless numbers of insects as they go, and are succeeded by other busy throngs. This goes on during the latter part of May, when, notwithstanding the inroads made in their numbers by the birds, the caterpillars have become so numerous and destructive that in some places many branches are denuded of their foliage. But soon the young of the resident birds are hatching, and they require an enormous amount of insect food. Thrushes, sparrows, swallows, flycatchers, warblers, wrens, cuckoos, titmice, blackbirds, jays and many other birds of the forest, orchard, pasture, field and meadow all repair to the grove, where food is so plentiful and so easily obtained. Soon the destruction of the caterpillars is doubled, as the young birds, fully fledged, are led by their parents to these favorable spots. The trees in some localities have now been almost entirely denuded of their foliage, and stretch out their bare arms as if in supplication for deliverance. Their branches are festooned with the webs and threads spun by feeding worms. Many of the insects have pupated, and some have emerged from the chrysalis, but the birds are still busy among the desolated woods. Sparrows, thrushes, cuckoos, jays and crows are hopping among the branches or upon the ground, picking up, killing and devouring the caterpillars or tearing open the cocoons. Flycatchers are flitting about among the trees, catching the flying moths. Titmice are searching in the crevices for eggs. The young of the grouse, quail, towhee and thrush are fed largely upon insects on or near the ground. They destroy vast quantities of these during the summer.

Now look more closely, and you will see that injurious insects have other though smaller foes. Ichneumon flies are thrusting their sting-like ovipositors into the bodies of the caterpillars. Beetles of the genus *Calosoma* are climbing the trees in search of caterpillars, others of the genus *Harpalus* are destroying caterpillars and pupæ on the ground. Strange bugs are piercing them with trenchant proboscis. At night, mice and squirrels, whip-poor-wills and bats come to the feast, while the quavering note of the screech-owl is heard intermittently between his lepidopteran meals. As summer grows into fall, the warblers sweep through the woods, bringing with them their young, and taking toll as they go from the insect pests. In the season of the falling leaves, the sparrows, thrushes, crows and jays are busy destroying many of the tree enemies that have been left by the summer visitors. As the leaves fall and the snow comes, the woods appear almost deserted; but here and there a party of titmice will be found, and a few woodpeckers, nuthatches, kinglets and jays remain about the woods all winter. These birds, feeding largely upon the hibernating insects and their eggs, deposited on the bark or in its crevices, are enabled during the winter months to destroy far more insects, either dormant or in embryo, than the same number of birds can dispose of in summer.

When the snow comes, the hares and mice, driven by hunger, gnaw the bark of the young trees. As these animals are very prolific, they would cause great havoc in the woods, especially among the younger trees, were it not for the solemn owl, who sits alone, and from his watch-tower in some old pine looks down more in sorrow than in anger, and gathers them into his larder. It is remarkable how many hares, mice and other small animals a large owl will destroy in winter. The owls are also liberal providers for their young. I once found in the nest of a great horned owl (*Bubo Virginianus*) two young owls less than three days old, and lying beside them, and partially covering them with the fur, were the hind quarters of a hare. In the nest of a barred owl (*Syrnium nebulosum*) in Woburn there was found the greater part of a hare and several other small animals, which apparently had been provided as food for two very young owls. Owls as a class are among the most useful birds. They destroy great quantities of insects, as well as numbers of field mice, but comparatively few birds and poultry. The fox is another great destroyer of mice and hares, and is not therefore by any means an unmixed evil.

Let us go back now to the western forests, where man has not yet disturbed nature, and observe the sequence of nature's forestry. In this untrodden wilderness, trees which have outlived their use-

fulness and become weakened by old age must come down to make room for those younger and more vigorous. Their forms must then be reduced to dust, to supply the new growth with nourishment. Dust unto dust, — it is the law. In a forest of firs, pines and cedars on the Pacific slope the trees have nearly terminated the allotted period of their existence. Some of them have already fallen, letting in light and air among the young trees which are springing up to take their place. An army of insects attacks the remaining trees, defoliating them and letting in the light and heat of the burning summer sun. This still further stimulates the growth of the young trees, which are coming up partly shaded by the trunks and limbs of the forest giants; but its fierce rays only serve to weaken the old trees, as they stand naked under the cloudless sky. The sap pauses in its flow, and they are now in a condition to invite attacks from the bark beetles (*Scolytidae*). A host of these appear, boring into the inner bark, where they cut their channels through the liber and cambium and along the surface of the wood beneath. The diseased trees are now doomed. Helpless, they are attacked by a host of borers and other wood-eating insects. Death from a thousand wounds ensues. The insects channel, cut and powder the substance of the trees, wood-rot attacks the trunks, limbs fall and tops crash down. Some night a great wind comes down through a mountain gap and rushes through the forest. Giant trunks are uprooted and thrown against others still standing, shattering all. Great trees tottering to their fall crash against others already fallen. Bending with mighty groan they break short off from the stump with a fearful crash, and their tops sweep through the air with a moaning shriek, which is lost in the thunder of their fall. Down they go like a row of blocks before the awful wind. Their downfall shakes the earth, the fowls of the air hide their heads in fright, the beasts of the forest crouch closer in their dens or slink away in terror. When morning comes the old forest is no more, but in its place a tangled windfall lies, where one can walk for miles on fallen trunks without touching foot to the ground. Amid this mass of trunks the bear will find his den. Here he will tear away the decaying bark with his claws to get at the ants burrowing beneath. Here the swila berries and the salmon berries will grow and the skunk cabbage will flourish in the swales. Here is good food for the bear. The bear is not only a forest planter but also an agent of destruction to the ruined forest and a cultivator of the soil for the new growth. In this work the wild hog, fox, marmot, elk and other animals have a share. Here also is the home of the woodpeckers, for

they have now a mission to perform. They must do their part in preventing too great an increase of the wood-eating beetles, and so protect the young pines springing up among the ruins where the forest that is to be is rising from the bones of its progenitors.

Years roll away, and a new forest waves its branches where the old trees once stood. All that remains of the old now is a great trunk, forming a natural bridge across the stream. Huge and moss-covered it lies, a relic of the past. Along its upper surface lies a well-beaten path, traversed by the shuffling bear, the slinking wolf or the timid deer, descendants, it may be, of the animals who were sheltered by its branches in their prime.

But, you say, what is the practical bearing of all the foregoing? What the utility of the observations made? Know, then, that we cannot study the relations of the creature to its environment without learning something of the great plan governing all. We cannot enter upon the consideration of any of the forces which regulate the increase of animal or vegetable life without being brought face to face with the great laws by which the balance of nature is preserved. How beautiful and yet how complex is this great plan, by which each species of plant or animal fits into the proper place just so long as it serves a useful purpose, then filling a subordinate place, and becoming extinct when its mission on this earth is ended.

Were there no law regulating the increase of the pine, it would be but a few centuries ere the whole earth would be covered with pines. In such a case there could, of course, be no wood-eating borers and no birds to feed upon such insects; there could be no grass-eating animals, for there would be no grass; man himself could not exist.

Wood-eating insects are no doubt a necessity, when properly held in check by the birds which feed on those insects. If a single species of insect were allowed to go unchecked, it would be but a few years before all the foliage upon the continent would be destroyed. Kirkland has figured that the unchecked increase of the gypsy moth (*Porthetria dispar*) would in eight years destroy all foliage in the United States. It is easily demonstrable that certain other species of insects, if unrestricted, could cause similar devastation. When such insects have spread over the continent, such an increase and such a devastation can only be prevented by the natural enemies of those insects; and here comes a practical lesson. Man should not disturb the balance of nature. But what does man do to preserve this balance of nature? Generally, nothing. What does he not do to disturb it? Man enters a new

country, destroys the forest (and with it the forest animals), plants new crops, invites new insect pests, and at the same time exterminates the birds and animals which feed upon those pests. He destroys the blackbirds of the west, because they feed upon the corn; the grouse, plover and quail he sends to market for profit, doing his best to exterminate them all. Soon the chinch-bug runs riot, cut worms destroy his corn, migrating locusts sweep away his crops and gaunt famine stalks in their path.

The Siberians kill the birds for the milliners. Soon cut worms, locusts and other noxious insects destroy the crops and nearly starve the inhabitants. Thus both bird and peasant suffer on the altar of fashion. Even the Siberians can learn by experience, and laws with heavy penalties are passed and enforced to protect the birds.

But man thinks he can improve upon nature. He introduces new forces for a purpose. A water plant is imported into the southern States from South America. It chokes up the rivers, and navigation is suspended. A snake-eating mammal is introduced from India to an island in the Carribean. Its predaceous habits become the indirect cause of such an increase of insects as to render the island almost uninhabitable. The farmers of Australia first destroy the game and then introduce the English rabbit. Great stretches of country are soon a barren waste, given up to the rabbits. Australia also imports a sparrow, which soon destroys the grain crops. Unheeding this sad experience, we introduce into the United States the same sparrow to feed upon the span worms in our parks. It destroys the span worm, but drives away our native birds, and our parks are soon infested with a host of caterpillars. It also destroys our grain and fruit.

Verily, as Wilson Flagg says, "man is only a half reasoning animal; the blood of the ape still courses through his veins."

Other introductions of insects and plants occur. The Russian thistle is imported, and sweeps over our western prairies, adding to the farmer's "crown of thorns." Introduced grain insects destroy the crops. Moths and scales carelessly imported injure and destroy the trees.

Let man, then, study the natural conditions of field and forest, abandon all attempts to improve upon nature by introducing new forms of animal or vegetable life, and devote his misplaced energies to protecting those native birds and animals which are the naturally constituted guardians of vegetation. This is the first great lesson to learn from nature's forestry.

Now for minor details. From nature's planting we may learn the depth to which the seed should be buried, and that, when a wood lot is cut off, some trees should be left to shade the young plants. We may learn that young oaks grow best on pine ground and when shaded by a few pines; that timber trees grow best and straightest when they are planted thickly, so that the tops, continually reaching for the light, build up a tall, straight trunk. We may observe how the lower limbs of the pine die and fall off, so that the woodrings of later years will form clear timber, free from knots. We may anticipate nature's pruning here by trimming off the lower branches of young pines, continuing this process year by year as the trunk grows upward, so that in thirty or forty years we may grow from the seed good, clear white pine timber, free from black knots. We can remove sprout growth, leaving seedling trees, getting cord wood first and good timber later. We can anticipate nature again by cutting the weaker trees ere they begin to decay, and by rational forest management we can secure an annual product from the wood without sacrificing it as a whole. We can protect the birds who, living in the woods, will help to keep down the insects, not only there but in the near-by field, orchard or garden.

Meanwhile, study nature's methods. Her book is always open, and "he who runs may read."

MASSACHUSETTS
CROP REPORT

FOR THE

MONTH OF JUNE, 1898.

ISSUED BY

WM. R. SESSIONS,

SECRETARY STATE BOARD OF AGRICULTURE.

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CROP REPORT FOR THE MONTH OF JUNE, 1898.

OFFICE OF STATE BOARD OF AGRICULTURE,
BOSTON, MASS., July 1, 1898.

Bulletin No. 2, Crop Report for the month of June, is herewith presented. We desire to call the attention of our readers to the article at the close of the bulletin, on "The San José Scale in Massachusetts," by A. H. Kirkland, M.S., assistant entomologist to the committee on gypsy moth, insects and birds.

PROGRESS OF THE SEASON.

The June returns of the United States Department of Agriculture (Crop Circular for June, 1898) show the acreage of spring wheat to be 16,800,000 acres, which, added to the area of winter wheat reported last month, indicates a total wheat acreage of about 43,000,000 acres, or rather over 3,500,000 acres more than last year. The average condition of spring wheat is 100.9, an almost unprecedented condition, against 89.6 last year and a June average of 92.5 for the past ten years. The average condition of winter wheat is 90.8, as compared with 78.5 last year, and 81.6, the average for the last ten years.

The total reported acreage of oats is 1.6 per cent less than last year. The average condition is 98, as compared with 89 on June 1, 1897, and 90.1, the average for the last ten years.

The acreage reported under barley is 5.3 per cent less than last year. The average condition is 78.8, as against 87.4 last year, and 89.9, the average for the last ten years.

The acreage under rye shows a decrease of 3.5 per cent, as compared with last year. The average condition of rye is 97.1, as compared with 89.9 on June 1, 1897, and 90.6, the average for the last ten years. The present condition is the highest for a long series of years.

The final reports on cotton planting make the area 22,460,-334 acres, a reduction of 1,631,060 acres from last year, or 6.8 per cent. The general condition is highly favorable.

Returns received would indicate a general increase in the acreage of rice and a fairly good condition, ranging from 70 in Louisiana to 95 in Georgia.

There is undoubtedly a large increase in the acreage of clover, though no statistical comparison can be made for the country as a whole. The condition of clover is highly satisfactory, an average of more than 100 being reported from many States.

The condition of spring pastures is phenomenally high, there being in this case also but few States where it does not approach or exceed 100.

The season for peaches has been highly favorable throughout most of the eastern half of the country. In Georgia, probably the greatest peach-growing State in the Union, the condition is 105.

In all the New England States except Rhode Island the condition of apples is considerably above the June average for the last ten years.

In Massachusetts the acreage of rye compared with last year is given as 95, and the average condition June 1 as 100; the acreage of oats as 99, and the condition as 99; the acreage of barley as 99, and the condition as 90; the acreage of clover as 98, and the condition as 102; the average condition of spring pasture as 104; the average condition of apples as 93, and of peaches as 70.

TEMPERATURE AND RAINFALL FOR THE WHOLE COUNTRY.

[FROM UNITED STATES CLIMATE AND CROP BULLETINS.]

Week ending May 30. — The week averaged warmer than usual eastward of the Rocky Mountains, except in the extreme northern districts from the upper Missouri valley to the upper Lake region and on the Atlantic coast from New Jersey northward, where it was cooler than usual. The deficiency in temperature along the New England coast ranged from 3° to 7° per day. In the plateau region, Oregon and California, it averaged cooler than usual. There was more than the usual amount of precipitation over the

central and northern Rocky Mountain regions, throughout the Missouri and upper Mississippi valleys, in New England and on the middle Atlantic coast. Elsewhere the precipitation was generally below the average. The weather conditions were especially favorable to crops in the principal agricultural States.

Week ending June 6. — The week was warmer than usual in all districts east of the Rocky Mountains, except on the Atlantic coast from North Carolina northward to New England, where it was from 1° to 6° cooler. Also cooler than usual throughout the plateau regions and over the greater portion of the Pacific coast States. It was warmer than usual along the immediate coast of central and southern California and western Washington. In the districts east of the Mississippi the week has been generally dry, a large area, including portions of the central Mississippi and lower Ohio valleys, Lake region and middle Atlantic States receiving practically no rain. There was less than the usual amount of rain in the upper Missouri valley and in northern Washington. Conditions have been generally favorable to crops east of the Rocky Mountains, but in the Rocky Mountains and on the Pacific coast it has been too cool.

Week ending June 13. — The week was warmer than usual in the Mississippi valley and in the districts to the eastward, except in northern Wisconsin, the upper Michigan peninsula, Maine, and the immediate coast of northern Florida, where it was cooler than usual. The daily temperature excess amounted to more than 3° per day in most sections. The week averaged cooler than usual on the immediate coast of central California, and throughout the eastern Rocky Mountain slope and the upper Missouri valley. More than the usual amount of rain fell in Texas, over the central Rocky Mountain slope, in the lower Missouri and upper Mississippi valleys, over the greater part of the Lake region and northern New England. The week was generally drier than usual elsewhere, there being practically no rain along the immediate Atlantic coast from southern New England southward. Upon the whole, the weather conditions were generally less favorable to crops than those of the preceding week.

Week ending June 20. — The week was cooler than usual

from the upper Mississippi valley eastward to the New England and middle Atlantic coasts, except at a few immediate coast stations in New Jersey and southern New England. The week averaged warmer than usual on the south Atlantic coast, in the upper Missouri valley, over the central and northern Rocky Mountain and plateau regions and over the greater part of the Pacific coast. Abundant rains have fallen in northern New England and over the greater portion of the country from the south Atlantic coast westward to the south-eastern Rocky Mountain slope. There was less than the usual amount of rain over the northern districts from the upper Missouri valley eastward to the lower Lake region, including the southern New England coast. With generally favorable temperature conditions and abundant rains over the greater part of the country east of the Rocky Mountains, crops made substantial progress.

SPECIAL TELEGRAPHIC REPORTS.

[WEATHER BUREAU, BOSTON.]

Week ending May 30. — New England. Boston: Cloudy, wet week, except in eastern Maine and northern Vermont, where conditions were favorable; vegetation has advanced and is in fine condition; farm work at a standstill, soil too wet to plant or cultivate; cool, wet weather unfavorable to tobacco plants; season now behind average.

Week ending June 6. — New England. Boston: Week favorable in Maine, northern Vermont, New Hampshire and western Massachusetts, where crops and farm operations progressed favorably; for remaining portion of district, continuous cloudy weather, with light rains, fogs and low temperature, was unfavorable; vegetation advanced slowly; farm work at a standstill; tobacco setting well advanced, plants reported small and backward.

Week ending June 13. — New England. Boston: Weather conditions excellent for crops, planting and all farm work; vegetation has advanced rapidly, grass being a week to ten days in advance of average; rain much needed in northern Vermont; tobacco setting progressed well; past week most favorable of season.

Week ending June 20. — New England. Boston : Weather favorable in nearly all sections ; abundant sunshine and seasonable showers ; light frosts in northern sections, 15th and 16th, but slight damage resulted ; rain is needed in Connecticut and parts of Rhode Island and Vermont ; tobacco setting completed, plants scarce, weather too dry.

WEATHER FOR JUNE, 1898.

June opened unfavorably for the farmer in all parts of the State except the extreme western counties, where fair weather was prevalent during the first week ; in eastern and central portions the weather was damp and cold, with almost daily rains and high north-east winds. The total amount of precipitation during this period was not excessive, but the continued cloudiness retarded the growth of crops and interfered with farm work in general. The week ending with the 13th was almost perfect for crop development ; sunshine was abundant on all but one day during the week, and crops which had been seriously delayed in growth by weeks of unfavorable weather made a most marked improvement. The week ending June 20 was also most auspicious for farming operations, although showers were quite general on the 14th and 19th. In the interior of the State light frosts occurred on the mornings of the 15th and 16th, but no resulting damage has been reported. At Concord, Mass., on the morning of the 16th, the minimum temperature was 38°, dangerously near the frost line. The last week of the month was in many sections of the State considered the best of the entire season ; bright, sunny days were the rule, and high temperatures prevailed, especially on the 25th and 26th, when 90° or above was reported from nearly all sections. As a whole, the month was practically normal in temperature, but a slight deficiency in precipitation was noted throughout the State.

In the circular to correspondents, returnable June 23, the following questions were asked : —

1. What insects are proving injurious in your locality ?
2. How is Indian corn looking, and what is the acreage as compared with previous years ?

3. Has haying begun, and what is the prospect for the crop?

4. How does the acreage of early potatoes compare with previous years, and what is the promise for the crop?

5. How do early market-garden crops compare in yield and price with former years, and what is the prospect for those not yet harvested?

6. How do the quantity and price of dairy products and the supply and price of dairy cows compare with former years?

7. What is the condition of pasturage in your locality?

8. What is the outlook for such fruits and berries as are grown for market, naming them?

Returns have been received from 169 correspondents, and from them the following summary has been made up:—

INSECTS.

Insects do not appear to be doing any notable damage, except in isolated cases; in fact, very many correspondents report that there is little damage from this source. Potato bugs are, of course, the insect most frequently reported, but they appear to be nowhere injurious out of the common. Currant worms, cut worms, tent caterpillars, canker worms and striped squash bugs come next, and appear to be about equally prevalent, each being mentioned by from twenty to twenty-five correspondents. Other insects mentioned are rose bugs, white grubs, spittle insects, cabbage maggots, wire worms, leaf rollers, onion maggots and cranberry-vine and fire worms.

INDIAN CORN.

Indian corn is at present looking fairly well, as a whole, although it is rather backward. The condition is remarkably good, when the cold, wet weather of the first of the season is considered. The acreage appears to be about the same as usual, reports of decreased acreage in some sections being balanced by increases in other quarters. With good weather from now on, the prospect for the crop may be considered as good.

THE HAY CROP.

At the time of making returns, haying had not generally begun. Hoeing is greatly behind in most sections, and this may operate to retard haying, but it will probably be well under way by date of issuance of this bulletin. The crop is generally spoken of as very heavy indeed, many speaking of it as the heaviest ever known. With good weather for harvesting, the quality should also be excellent. There are some complaints of lodging, but these are by no means general.

EARLY POTATOES.

The returns indicate that the acreage of early potatoes is greatly above the average. The crop generally promises very well, although a few complain of the seed failing to germinate, owing to wet weather. The vines have as a rule done better thus far on light land than on heavy land.

MARKET-GARDEN CROPS.

Early market-garden crops are rather late, as a rule, but those already harvested generally made good yields. Prices rule about as usual, though the tendency is downward rather than upward on some crops. Later crops generally promise well, and the outlook would appear to be satisfactory at present.

DAIRY PRODUCTS.

There appears to be a slight increase in the total supply of dairy products, due, in all probability, to the excellent feed in pastures. This has produced a surplus of milk in many sections, which surplus is turned to the manufacture of butter. The price of milk still keeps up where it is sold, but dairy products, as a whole, are still on the downward path. Good dairy cows still command good prices, however, and the supply does not appear to be equal to the demand.

PASTURAGE.

The heavy rains, which have kept cultivated crops back, have been the best thing possible for pasturage, and pastures were probably never in better condition at this time of year.

The feed is thick and rank, and there is every probability that pastures will carry through without failure, even if there should be a deficiency in the future rainfall.

FRUIT AND BERRIES.

Strawberries are yielding the heaviest crop for years, and the quality of the fruit is excellent, but the prices at the time of writing are most discouraging. In many cases strawberries have been sold for less than the cost of picking and marketing them. Raspberries, blackberries and currants all promise well. Plums and cherries promise good average crops, but pears are hardly up. Apples are much below the average, as they did not generally set well and have also dropped badly. What few returns there are in regard to peaches do not indicate an average crop. Wild berries promise to fruit heavily.

NOTES OF CORRESPONDENTS.

(Returned to us June 23.)

BERKSHIRE COUNTY.

Mount Washington (H. M. WEAVER). Potato bugs are doing some damage. Indian corn is growing very fast, with about the usual acreage. Haying has not yet begun, but the prospect for the crop is better than I ever remember. The acreage of early potatoes is larger than usual and they promise a good yield. Dairy cows higher in price, their products lower; quantity of dairy products above average. Pasturage is in good condition, better than last year. Fruit of all kinds promises well; strawberries very plenty, but prices low.

Otis (S. H. NORTON). Potato bugs are plenty. Corn is very backward, but about the usual acreage is planted. Haying is hardly begun, but a large crop is promised. There is about the usual acreage of potatoes planted and they are looking well except on low lands. Dairy products about average in quantity, prices low; cows scarce and high. Pastures are in fine condition. Wild berries promise well.

Becket (W. H. SNOW). Potato bugs and currant worms are doing some damage. Indian corn is looking pretty slim, being late planted and much seed rotting in the ground; acreage smaller than usual. Haying has not yet begun, but there is a prospect of a big crop. Acreage of early potatoes smaller than usual, owing to lack of seed; crop backward, owing to cold and wet. Dairy products about as usual in quantity and price; dairy cows possibly a little lower than usual in price. Pasturage is in very good condition. Strawberries, blackberries and huckleberries look finely.

Stockbridge (F. A. PALMER). Indian corn is very backward, with about the usual acreage. Very little hay cut as yet, but the crop is very heavy. The acreage of early potatoes is about as usual, but the crop is late, owing to the season. Dairy products are about as usual in quantity and price. Pasturage is in extra good condition. Berries are doing nicely and promise a good crop; also fruits in general. Heavy rains and cold weather are delaying farm work.

Hancock (C. H. WELLS).—Tent caterpillars, currant worms and potato beetles are doing some damage. Indian corn looks finely, with some increase in acreage. Haying has not begun, but there is prospect of an abundant crop. No early potatoes raised, late ones generally looking well. Butter is selling at a slight advance over last year's prices; cows bring \$5 each more than last year. Apples, cherries and strawberries look well, but plums and pears are scarce.

Hinsdale (S. M. RAYMOND).—Potato bugs are doing some damage. Corn is very backward and the acreage is much smaller than usual. Haying has commenced in some places and the crop looks well. The acreage of early potatoes is much less than usual, but the crop looks well. Market-garden crops are very late and the prices are lower than usual. Quantity of dairy products about as usual, prices less; supply of dairy cows good, prices from \$35 to \$45. Pasturage is in very good condition. The outlook for all fruits and berries is good.

New Ashford (ELIHU INGRAHAM).—Currant worms are doing some damage. Indian corn is very backward, with about the usual acreage. Haying has begun, with every prospect of a large crop. There is the average acreage of early potatoes and they are now looking well. Early market-garden crops are about average as to yield and price. The quantity of dairy products is larger than usual, butter low in price; cows bring a good price. Pasturage is in fine condition.

Savoy (W. W. BURNETT).—Potato bugs are doing some damage. Indian corn is looking fairly well, but the acreage is hardly up to the average. Now and then some one has commenced haying; the crop is a mammoth one. The acreage of early potatoes is less than an average one. Early market-garden crops are below the average in yield and price and all crops are later than usual. There is the full average quantity of dairy products; a fair supply of milch cows, at good prices. The pastures are in better condition than usual. The outlook for apples is fair. There has been so much wet weather that much hoeing remains to be done in haying time.

FRANKLIN COUNTY.

Monroe (D. H. SHERMAN).—Potato bugs are doing some damage. Indian corn is late; but little is planted in this section. Haying has not begun, but the prospect for the crop is good. The acreage of early potatoes is about the same as usual, but the crop is very late. Quantity of dairy products good, prices lower than usual; some cows for sale, prices good. Pasturage is in good condition. Apples set well; pears not at all, although they blossomed full.

Colrain (A. A. SMITH).—Potato bugs are doing some damage. The acreage of Indian corn is increased 25 per cent and it is looking finely. Haying has begun when the weather permits and a large crop is being cut. The acreage of early potatoes is increased 25 per cent, with bright prospects for the crop. No early market-garden crops harvested as yet, but all look well. Quantity and price of dairy products about as usual. Pasturage was never in better condition. Strawberries are late.

Shelburne (G. E. TAYLOR).—Potato bugs have been quite destructive. Corn is a fairly good stand and is looking well, but is backward; acreage larger than usual. Haying has begun and the prospect is for an enormous yield of No. 1 hay. There is about the usual acreage of early potatoes and they promise well. Dairy products are up to the average in quantity and price; cows find a ready sale, at the usual prices. Pasturages were never in better condition. Apples are set for a great crop and all kinds of berries promise well.

Conway (J. C. NEWHALL).—Tent caterpillars are doing the most damage of any insect. Acreage of Indian corn about as usual, but it is late and there is complaint about its coming up, owing to the cold, wet weather. Haying began about the 15th, but little has been done yet; crop the heaviest ever known, but badly lodged. Acreage of early potatoes larger than usual and looking fairly well. Yield and price of early market-garden crops about as usual. Quantity of dairy products on the increase, price little better than a year ago; milch cows in good demand and good cows sell rather high. Pasturage never was better. Strawberries are a fine crop.

Deerfield (CHAS. JONES).—No insects, except a few potato bugs. Corn is looking well, but is late; acreage about average. Haying has not begun, but there is more than an average crop. About the usual acreage of early potatoes and they are in good condition. Quantity and price of dairy products a little above last year; dairy cows about as usual as regards supply and price. Pastures are in good condition. Strawberries and raspberries are doing well. Outlook for apples very good, but not many pears. Tobacco is late, as plants have been very backward and are not all set.

Montague (C. S. RAYMOND).—Striped and black squash bugs and cut worms are doing some damage. Corn is very backward, but is looking fairly well; acreage about as usual. Haying commenced about the 15th, with a heavy crop. The acreage of early potatoes is about the same as usual and they look very promising at present. Yield of market-garden crops good, prices about as usual; prospect good for later crops. Quantity of dairy products greater than usual, price of butter less; cows 10 per cent above former prices. Strawberries are a full crop and raspberries promise well.

Erving (CHAS. F. CLARK).—Currant worms, potato bugs and tent caterpillars are doing some damage. Corn is looking well, with about the usual acreage. Haying has begun with the prospect of a large crop. The acreage of early potatoes is increased and a good crop is promised. Early market garden crops are about average as regards yield and price; later ones promise well. Quantity and price of dairy products are about as usual. Pastures are in good condition. Apples, pears and strawberries all promise well.

Northfield (T. R. CALLENDAR).—Potato bugs are not as numerous as usual, but white grubs are working some in the grass. Corn is very late, with the acreage about as usual. Some clover has been cut and there is prospect of an unusually heavy crop of hay. Acreage of early potatoes larger than last year; crop generally looking well, though late. Garden crops are ten days behind average years. Milk is shipped to the city at starvation prices; butter better than last year; cows high. Pastures are in prime condition. Apples have set poorly; strawberries only an average crop. Tobacco setting not yet completed, but that set is looking well. Cucumbers have done well and a good stand is assured.

HAMPSHIRE COUNTY.

Prescott (W. F. WENDERMUTH).—Cut worms are doing some damage. Corn is small and late; acreage about average. Haying has begun in a small way and there is prospect of a good crop. There is the average acreage of early potatoes and the crop promises well. Quantity of dairy products increased, price somewhat less; price of dairy cows has advanced sharply in the last three years. Pasturage is in good condition. Prospect good for apples; no other fruit grown to any extent for market.

Enfield (D. O. CHICKERING).—Potato bugs and tent caterpillars are moderately plenty. Corn is looking fairly well, considering the season; acreage about an average. Haying is just commencing, with the prospect of a fair crop. The acreage of early potatoes is rather greater than usual and the crop promises well. Dairy products are not quite as high as formerly and cows are about the same in price. Pastures are in good condition. There is an abundant yield of all kinds of berries.

Amherst (WM. P. BROOKS).—Corn is backward, with the usual acreage. Haying is just beginning and the crop is very heavy, though badly lodged. Acreage of early potatoes rather larger than usual and crop looking uncommonly well. Peas later than usual, yield and prices about average. Milk abundant and creameries making a large amount of butter; prices low; cows scarce and high. Pastures are in unusually fine condition. Strawberries and cherries excellent; blackberries, raspberries, currants and gooseberries promise well; apples and peaches have set and grown well. Tobacco plants scarce and backward and setting late.

South Hadley (H. W. GAYLORD).—We are unusually free from insect pests. The acreage of Indian corn is increased perhaps 10 per cent, but it is looking badly and is small. Very little grass has been cut as yet, but a heavy growth awaits us. The acreage of early potatoes is rather increased and they are looking the best of any of the hoed crops.

Yield of early market-garden crops good and prices reported low ; prospects for later ones good, if we can have a little warmer weather. Good cows are scarce and high ; dairy products are reported low, owing to every one increasing his dairy stock. Pastures never were better. Strawberries are good, raspberries and blackberries just past a very full bloom ; apples fair ; pears, peaches and grapes all indicating a good crop.

Williamsburg (F. C. RICHARDS). — Corn is somewhat backward, but is looking well ; acreage less than usual. Haying has just commenced ; crop abundant, but not quite as thick at bottom as last year. Rather more potatoes are planted than usual, and the crop looks well. Dairy products are about as usual in quantity and price ; cows higher in price. Pasturage is in excellent condition. Strawberries are abundant ; no raspberries and no cherries ; pears did not set. Nearly all varieties of apples, with the exception of Baldwins, which set three-fourths of a full bloom, will not give more than half a crop.

Huntington (H. W. STICKNEY) — Potato bugs are doing some damage. Indian corn is looking well. An unusually large crop of hay is promised. Early potatoes promise to be a very good crop. Dairy cows command good prices. Pastures are in unusually good condition. The outlook for fruits is very good, especially for strawberries. There is considerable old hay in the barns and there is likely to be some trouble to find room for this year's crop.

Plainfield (S. W. CLARK). — Potato bugs and squash bugs are beginning to work. Indian corn is late, but vigorous ; acreage about as usual. Very little haying has been done, as the weather has been bad ; a heavy crop is in prospect. There is about the usual acreage of early potatoes and about a normal crop is promised. Gardens are late, but otherwise good. Our creamery made last month 5 per cent more butter and sold half a cent higher than last year. Pasturage is in very good condition. An average crop of apples is now promised.

Middlefield (J. T. BRYAN). — Potato bugs are doing some damage. Corn is backward, with a slight increase in acreage. Haying is just beginning, with the prospect of a large crop. Average acreage of early potatoes and outlook for the crop good. All garden crops in good condition, but backward. Dairy products low in price, but in good demand ; cows in demand, at good prices. Pastures are in excellent condition. Outlook good for all kinds of fruit and berries.

HAMPDEN COUNTY.

Russell (E. D. PARKS). — Potato bugs and tent caterpillars are very numerous. The acreage of Indian corn is about the same as usual, but the crop looks very poor, on account of cold, rainy weather. Haying has begun and there will be a very heavy crop indeed. Potatoes are looking fairly well, notwithstanding the number of bugs. The quantity and price of dairy products are fully up to the average for the time of year. Pastures are in excellent condition. All fruit is looking very promising at present. Good farm help is scarce just at present.

Southwick (L. A. FOWLER). — Potato bugs and cut worms are doing some damage. Indian corn looks well, but is rather late ; acreage about as last year. Haying has not yet begun, but will be in a few days and there is the prospect of a fine crop. Early potatoes are in good condition, with the usual acreage. The yield of early market-garden crops is good and the prices about as in previous years. The quantity and price of dairy products are about as last year ; dairy cows scarce and the price high. Pastures are in good condition. Strawberries are abundant and cheap ; apples very promising ; cherries, blackberries and currants look well.

Westfield (C. F. FOWLER). — Tent caterpillars are doing considerable damage. Corn is looking well, with a full average acreage. Haying

has not fairly commenced, but there is every prospect of a large crop. The acreage of potatoes is far in excess of previous years and the present outlook is for a very large crop. Early peas are not yielding very heavy. Milk and butter are both below a paying basis. Pasturage is very good. Strawberries are a drug on the market; apples dropping badly; pears and plums promise a full crop; few peaches; grapes being injured by rose bugs.

West Springfield (N. T. SMITH).—Cut worms and cabbage maggots are doing some damage. Indian corn is looking well, but is backward; acreage average. Haying not begun; good growth of grass, but lodging considerably. There is about the usual acreage of early potatoes and they are looking well. Early market-garden crops are about as usual as regards yield and price, and later ones are looking fairly well. Too much milk; too little money; price of cows high. Pastures are in fine condition. Cherries falling badly, poor outlook for peaches, pears and apples set well, strawberries ripened too fast and the price has been very low.

Agawam (R. DE WITT).—Cut worms and potato bugs are doing some damage. Corn is looking fairly well, but the acreage is somewhat less than usual. Haying is just beginning and there is an extra crop. Acreage of early potatoes much in excess of previous years. Dairy products are much as usual as to quantity and price; good cows bring good prices. Strawberries are a good crop and very cheap; blackberries promise well.

East Longmeadow (J. L. DAVIS).—Potato bugs are doing some damage. Corn is two weeks late; acreage about as usual. Haying has begun and the crop will be heavy. A fourth greater acreage of early potatoes planted than usual; crop slow and backward. Fancy cows are high and scarce, no call for any other; A 1 cows are worth \$45 to \$60. Pasturage is in excellent condition. Apples good, peaches not over half a crop, blackberries and strawberries plenty.

Hampden (J. N. ISHAM).—Potato beetles are just appearing. Indian corn is looking well, with a somewhat increased acreage. Haying is just commencing; weather unfavorable, large crop. The acreage of potatoes is in excess of last year, with the promise of a large crop. The quantity and price of dairy products is fully equal to last year; supply of cows short and prices high. Pastures are in extra-fine growing condition. Strawberries good; also apples, peaches and cherries; pears have dropped from the trees; all other fruits look promising. Some pastures are so moist as to induce hoof trouble with the dairy cows and young stock.

Monson (A. H. WHITE).—Potato bugs are doing some damage. Corn is small and yellow; acreage a little above average. A few have begun to cut their hay. Early potatoes have been looking well, with an increased acreage. Dairy products about as usual in quantity and price; there has been an increased call for cows, and they have brought better prices. Peaches will be scarce; strawberries are plenty and cheap.

Brimfield (G. M. HITCHCOCK).—No insects have done any damage as yet. Indian corn is looking just about fair; acreage about as usual. Not much grass has been cut; old fields are light. The acreage of early potatoes is about the same as usual and they are looking well. Dairy products are very low, but cows are higher than in former years. Large crops of grass will be cut on new fields.

WORCESTER COUNTY.

Brookfield (F. E. PROUTY).—Currant worms are doing some damage. Corn is doing well; acreage larger than usual. Haying has hardly commenced, but there is prospect of a large crop. The acreage of early potatoes is about the same as usual and there is the promise of a good crop. Early market-garden crops are not up to the average in yield;

price about as usual. Price of dairy products about the same as last year; cows more plenty, with prices not as high. Pastures are in good condition. The outlook for fruit is good and strawberries are yielding well.

Spencer (H. H. KINGSBURY).—Corn is stocky and excellent in color and growing fast; no change in acreage. Haying has not generally begun, but there is now prospect of a very large crop. There is about the usual acreage of early potatoes and they are in excellent condition. The quantity of milk and butter produced is greater than usual and prices are weak, with slow sales. Pasturage is very abundant and stock is doing well. Apples, pears, cherries, blueberries and wild blackberries promise abundant crops. The demand for dairy stock has been good, the supply for sale limited, and prices much better than two years ago. Lettuce, radishes and strawberries are very plenty and low in price.

Oakham (JESSE ALLEN).—No insects doing damage at present. Indian corn is looking well, with a full average acreage. Haying has not begun, but there will be a great crop. Acreage of early potatoes about as usual and the crop is looking well. Early market-garden crops are about as usual in yield and price and the prospect for later ones is good. Quantity of dairy products good, price a little less than usual. Pastures are in excellent condition. Prospect good for strawberries, apples, pears and wild berries.

Petersham (S. B. COOK).—Corn is vigorous and of good color, but backward on account of late planting; acreage about as usual. Haying has not begun as yet and the crop will be larger than usual. The acreage of early potatoes is slightly increased and there is the promise of a large crop. The yield is somewhat less for many kinds of market-garden crops; prospect fair for those not harvested; prices same as usual. Quantity of dairy products in excess of former years, price lower; cows bring good prices. Pastures are in better condition than for many years. Prospect good for apples, pears, grapes, strawberries and blackberries; peaches and plums promise poorly.

Templeton (LUCIEN GOVE).—Tent caterpillars, currant worms and potato beetles are doing some damage. Indian corn is very backward, with a full average acreage. Haying has commenced to a limited extent, with a very large crop. There is the usual acreage of early potatoes; the crop is rather late, but is looking well. A light crop of asparagus; peas backward; beets and carrots did not come up well; prices rather lower than last year. Dairy products full in quantity; price low as last season; cows sell well, enough to meet the demand. Pasturage is in very fine condition. Strawberries, blackberries and raspberries in full supply; currants light; cherries rather a light crop; apples and pears rather better.

Hubbardston (C. C. COLBY).—Currant worms are unusually plenty and potato bugs are doing some damage. Corn is backward, with rather more than the average planted. Many of our farmers have begun haying and the prospect is for the largest crop in years. More early potatoes than usual were planted; crop backward, but looking well. While the prices of dairy products are very low, the price of dairy cows remains about the same as in the past few years. Pasturage is in excellent condition.

Harvard (J. S. PRESTON).—Tent caterpillars are doing some damage. Indian corn is looking very poorly, with about the usual acreage. A little haying has been done and the prospect for a large crop is good. The acreage of early potatoes is about as usual, but the vines do not look as thrifty as usual at this time of year. Early market-garden crops are very backward; yield good; prices a little below former years. Quantity of milk increasing every year; price low; very little butter made. Pasturage is in better condition than usual. Strawberries, blackberries and raspberries are in good form, but a little backward in ripening. Apples and pears promise a fair crop and peaches fair.

Clinton (P. B. SOUTHWICK). — Cut worms and potato bugs are doing some damage. Corn is late, as we have had but little favorable weather. Haying has commenced, with the prospect of a large crop. Potatoes are looking well and the prospect is for more than an average crop. Prices for market-garden crops have thus far been below the average. Not much change in the quantity and price of dairy products for the last few years; cows rather higher. Pastures are in good condition. Strawberries are plenty and cheap; cherries looking well, but not ripe; apples blossomed full, but did not set as well as they sometimes do.

Holden (G. S. GRAHAM). — Spittle insects and potato bugs are doing some damage. The acreage of Indian corn is probably more than an average, but the crop is small and backward. Some grass has been cut, but there has been no weather to dry it; crop more than average. The acreage of early potatoes is greater than usual. Milk is very plenty and low; cows very hard to find, and high when you find them. Pasturage was perhaps never in better condition. With sunshine and warmer weather we expect good crops of most kinds of fruit.

Southborough (E. F. COLLINS). — Potato bugs, striped squash bugs and cut worms are doing some damage. Corn is rather small, but is looking well; acreage about average. Haying is just beginning and there will be a large crop. Early potatoes are a very large acreage and promise a large crop. The prospect is good for all market-garden crops. Prices of dairy products are about the same as usual. Pastures are in very good condition. Apples promise a full crop where they have been sprayed. Canker worms did a great deal of damage.

Oxford (D. M. HOWE). — Acreage of Indian corn about average; crop looking finely, but a little late. Haying has begun and a good crop is being cut. The quantity and price of dairy products and the supply and price of dairy cows are about as usual. Pasturage is in good condition. Strawberries and raspberries will be plenty.

Uxbridge (AUGUSTUS STORY). — Potato bugs and rose bugs are doing some damage. Indian corn is looking very well indeed, with no special change in acreage. Haying has begun and there is a very heavy crop. No noticeable change in the acreage of early potatoes; the crop looks well and promises to be a heavy one. Peas, beans and small garden truck promise well. Prices for dairy products are less than last year, as a general rule. Pastures are in first-class condition. Strawberries are a little late and not quite up to last year in yield. Peaches scarce; pears fair, but not a large crop.

Blackstone (O. F. FULLER). — Cut worms are doing considerable damage. Indian corn is looking fairly well, but is late; acreage rather increased. Farmers have just commenced haying, and a good crop will be harvested if favorable weather is given. Potatoes are as a rule looking finely, with little damage from bugs. Market-garden crops are about the same as in former years. Dairy products bring about the usual prices; good milk cows bring a good, fair price. Pastures are in fine condition. Strawberries are plenty and a good crop will be harvested. There will be few plums, pears or cherries.

MIDDLESEX COUNTY.

Hopkinton (W. V. THOMPSON). — Canker worms are doing some damage. Indian corn is looking well, but is a little late. Haying has not begun, but the prospect for the crop is good. Acreage of early potatoes about the same as usual; vines are extra fine and promise a fine yield. Early market-garden crops about as usual in yield and price, and prospect good for later ones. Quantity and price of dairy cows about as usual. Pasturage is in good condition. Strawberries are a remarkably heavy crop, but are a little late.

Stow (G. W. BRADLEY). — Potato bugs plenty, very few canker worms. Indian corn is very backward; acreage about the same as usual. A few have commenced haying, with good prospect for a large crop. Potatoes have about the usual acreage and are looking well at present. Quantity and price of dairy products and supply and price of dairy cows about the same as in former years. Pasturage is in very good condition. Strawberries plenty, good prospect for apples and pears, blackberries setting well, not many peaches.

Boxborough (J. F. HAYWARD). — Canker worms, potato bugs and rose bugs are doing some damage. Corn is looking well; acreage about the same as in previous years. Haying has begun and there is the prospect of a large crop. Acreage of early potatoes about as usual and they are now looking well. The quantity and price of dairy products and the supply and price of dairy cows are about as usual. Pasturage is in fair condition. Strawberries, raspberries and blackberries are looking well.

Ashby (A. WETHERBEE). — Potato bugs and currant worms are doing some damage. Corn came up very well, but is somewhat backward; rather more planted than last year. No haying has been done as yet, but the crop will be very large. The acreage of early potatoes is rather larger than most years and the crop is looking very well. Asparagus was a light crop, owing to cold, wet weather; all other market-garden crops look well. Quantity of dairy products above the average; price average; cows in full supply and price high. Pasturage has not looked better for several years. Strawberries, currants and blueberries are looking well; pears, apples and peaches did not set very full. There is a large amount of clover in the grass and it is lodging some.

Dunstable (A. J. GILSON). — Very little injury by insects as yet. Corn is generally looking well, with about the same acreage as usual. Only a few have commenced haying, and there is the prospect of an abundant crop. No change in the acreage of early potatoes, and they are looking well. Quantity of dairy products full, with prices very low, especially for milk; good dairy cows are not plenty and somewhat higher in price than in former years. Pasturage is in good condition. Outlook for apples good; blackberries and strawberries looking well.

Westford (ARTHUR WRIGHT). — Insects are not as bad as in some years, although currant worms are doing some damage. Corn is very backward, with about the usual acreage. Haying has hardly begun as yet; large crop on most lands. There is about an average acreage of early potatoes and they are looking fairly well. The quantity of milk is larger than usual and the price the same. Pastures are in good condition. Strawberries a good crop; blackberries looking finely now.

Chelmsford (P. P. PERHAM). — Canker worms are doing some damage. Indian corn looks well, but is a little late for the season of the year. Very little hay cut as yet; prospect for a large crop never better. Early potatoes promise a larger crop than the average. Garden crops are large, especially early ones; late ones promise well. Quantity of dairy products very large, prices lower than the average; cows scarce and very high. Pastures were never in better condition at this time of year. Outlook for strawberries excellent; blackberries promise a fair crop, though not quite an average one.

Billerica (J. N. PARDEE). — Insects are conspicuously few. Corn at present is growing slowly, but of good color and promise; acreage about as usual. Haying has begun in a small way and the crop is a heavy one. Potatoes are looking well, with about the usual acreage. The quantity of dairy products increases, but the price does not vary much. Pastures are in very good condition. Strawberries are slow in ripening; peaches nearly a failure; apples promise a heavy crop in some orchards, while in others the trees blossomed poorly.

Carlisle (E. J. CARR). — Canker worms and potato bugs are doing some damage. Corn is very backward; acreage about the same as last year. There has been little haying done as yet, but the crop is very

large. More early potatoes than usual were planted, and they are looking well. Asparagus was a small crop, with better prices than last year. Price of dairy products the same as last year; supply of dairy cows short and price high. Pasturage is in the best of condition. Not many apples; blackberries blossomed full; very few peaches and pears.

Lincoln (SAMUEL HARTWELL). — Cut worms and striped squash bugs are doing some damage. Sweet corn to be picked green for the market is looking well. Haying has just begun, with a very heavy crop. About the usual acreage of early potatoes planted, but many rotted in the ground on account of the cold, wet weather. Asparagus yielded lightly, price above average; prospect good for market-garden crops not harvested. The quantity of dairy products is large and the price lower than usual. Feed is abundant, owing to continued rains. Apples plenty, pears light, peaches light, cherries average, strawberries large crop, currants light, blackberries large crop.

Wakefield (CHAS. TALBOT). — Striped squash bugs, potato bugs and canker worms are doing some damage. Acreage of Indian corn about as usual, but not up to former years in condition. Haying has just commenced, with an extra heavy crop. The acreage of early potatoes is about as last year and they are looking very well. Early market-garden crops are all looking well and have been marketed at fair prices. Butter cheap and of very good quality; dairy cows higher than usual. Pasturage was never in better condition. Strawberries large crop, apples not as plenty as expected, no peaches, pears fair.

ESSEX COUNTY.

Haverhill (EBEN WEBSTER). — Tent caterpillars, canker worms and striped squash bugs are doing some damage. Indian corn is a little backward, owing to wet weather; acreage about as usual. Not much hay cut as yet, but crop larger than usual. Acreage of early potatoes about as usual, but some failure to germinate on account of wet weather. Milk plenty, price a little less than last year; cows about the same as regards supply and price. Pasturage is in good condition.

Andover (M. H. GOULD). — Canker worms are doing some damage. Indian corn is rather backward, but the acreage is increased. Haying has begun and there is the prospect of a heavy crop. Acreage of early potatoes about as last year and promise of a good crop. The yield and price of early market-garden crops is about the average. There is an oversupply of dairy products and prices are low; cows plenty and price about as usual. Strawberries are very plenty, all berries looking well, apples blighting some.

Topsfield (B. P. PIKE). — Insects are doing but little damage. Indian corn is rather backward; acreage about as usual. Haying has not begun, but the crop will be the best ever known. About the usual acreage of early potatoes and the crop is very promising. Asparagus is not as good as last year and the price is about the same. Surplus in quantity of dairy products, prices a little lower; cows more plenty and a little lower in price. Pasturage was never in better condition. Strawberries are a full crop.

Wenham (N. P. PERKINS). — Squash bugs are our worst insect, lice on carrots are doing some damage and potato bugs are coming forward fast. Corn is looking well, although a little backward; not as much planted as in former years. Haying has commenced on light land and where grass is lodged; think there will be a fair crop. Potatoes vary, some fields looking well and others poorly. Peas will be a little later than usual and most market-garden crops will not be heavy in this locality. The supply of milk is large and the price has been slightly reduced in some cases; good cows are as high as ever. Pastures are in good condition and cows are getting along with less grain. Strawberries will

apparently be quite plenty, other berries setting fairly well, wild berries look promising. Apples did not set well and look scattering.

Manchester (JOHN BAKER). — Canker worms are doing some damage. Corn is looking well, with about the usual acreage. Haying has begun and the prospect is good for a large crop. The acreage of early potatoes is about the same as last year and the crop promises well. Early market-garden crops about as usual in yield and price and the prospect for those still unharvested is good. Dairy products are about as usual in quantity and price. Pasturage is in good condition. Currants, blackberries and nearly all fruits are good.

NORFOLK COUNTY.

Cohasset (E. E. ELLMS). Potato bugs and rose bugs are doing some damage. Indian corn is looking well, with about the usual acreage. Haying has begun and there is the prospect of a large crop. The acreage of early potatoes is larger than usual and the crop promises well. Early market-garden crops are about the same as usual as regards yield and price. Dairy products are cheaper than in former years. Pasturage is in excellent condition. The outlook is good for strawberries, gooseberries, currants and raspberries.

Randolph (R. A. THAYER). — Potato bugs and canker worms are doing some damage. Corn looks well, with about the usual amount planted. Haying has begun and there is a heavy crop of grass. Potatoes never looked better, with the full average amount planted. Peas are being harvested and bring a good price; prospect good for market-garden crops not yet harvested. Milk is sold at the same price as last year and there is no change to note in the price of good cows. Pastures were never better. Strawberries are a good crop.

Dedham (A. W. CHEEVER). — Cucumber beetles, canker worms, potato beetles and currant worms are all doing some damage. Indian corn is but little planted; sweet corn late, but of good color. The prospect is good for the hay crop, but not much has been cut as yet. Early market-garden crops are generally late, because of cold, wet weather. Pasturage is in unusually good condition. Strawberries are late, but promising; currants and gooseberries abundant; apples and plums injured by wet weather at time of blossoming; pears promising for an off year.

Medfield (G. R. CHASE). — Corn is backward and is looking badly; acreage 90 per cent of the average. Haying has begun, with good prospect for the crop; much old hay in barns and no market. There is an average acreage of early potatoes and the crop promises fairly. Yield of early market-garden crops average or a little less and prices good. Milk abundant, prices of dairy products low; dairy cows in light demand. Pasturage is in excellent condition. Strawberries are a large crop, but prices are low and will be lower.

Norfolk (G. E. HOLBROOK). — Cut worms and potato beetles are quite plenty. The full amount of corn was planted, but it is very small, though of good color. A good many began haying June 20; new-laid land is lodged badly. The acreage of early potatoes is much increased and the prospect for the crop is very good. Early market-garden crops about average as to yield and price. There seems to be an over-production of both milk and butter; good cows are high and scarce. Pastures were never in better condition. All fruit growers say that the outlook is good for all kinds of fruit except pears.

Foxborough (E. A. MORSE). — Potato bugs and vine worms on cranberry meadows are doing some damage. Corn is backward; acreage much larger than last year. Haying is just beginning, with a much larger crop than last year. The acreage of early potatoes is rather larger than usual and the vines are looking well. The price of peas is very low; prospect good for future crops. Quantity and price of dairy

products about as last year; dairy cows plenty now, price higher than last year. Pasturage is in fine condition. Strawberries are a big crop, raspberries looking finely, currants the same, apples good, pears fair, and cranberries promise a good crop if the worms can be kept in subjection.

BRISTOL COUNTY.

Easton (H. M. THOMPSON). — Cut worms are doing some damage to potatoes. Indian corn is looking well, but is late; acreage about as usual. Old hay fields are being cut and a heavy crop is in prospect. Acreage of early potatoes considerably below the average; crop average, but late. Early market-garden crops a little off, on account of wet season, with prices about as usual. Quantity of dairy products about as usual, price low; milch cows in good demand, at fair to good prices. Pasturage is in fair condition. Apples promise a heavy yield, pears not set well and have fallen off badly in some instances.

Attleborough (ISAAC ALGER). — Insects are not doing as much damage as usual. Corn is small for the season, but looks well; acreage about as usual. Haying has not yet begun, but the crop will be abundant. The acreage of early potatoes is about an average one. Early market-garden crops are about as usual in yield and price. Dairy products are about the same as usual in quantity and price. Pasturage is above the average in condition. Strawberries are a large crop. Apples and pears have dropped badly and it is now impossible to say what the crop will be.

Dighton (J. N. PAUL). — Canker worms and cut worms are doing some damage. Indian corn is looking well, with a small acreage. Haying has not begun, but the prospect for the crop is good. The acreage of early potatoes is smaller than usual, but a good crop is promised. Early market-garden crops are about average as to yield and price, with the prospect good for later ones. Quantity and price of dairy products about as usual. Pastures are in good condition. Dighton is now picking and shipping the largest strawberry crop it ever raised. The quality of the fruit is good, but the price obtained hardly pays the expense of picking and shipping. Apples and pears promise well.

Berkley (R. H. BABBITT). — Canker worms and cut worms are doing some damage. Indian corn has a smaller acreage than usual, but the crop is looking fairly well. Haying has just begun, with the prospect of a large crop. Many fields have come up badly, but otherwise early potatoes are looking very well. Many market-garden crops have suffered from wet weather, but prices are about as usual. Quantity and price of dairy products about average. Pasturage is in very good condition. Strawberries a large crop, prices ruinous; raspberries winter-killed to some extent; currants looking fairly well.

Westport (A. S. SIERMAN). — Canker worms and currant worms are doing some damage. Indian corn is in very good shape; acreage growing less every year, by reason of grain being so cheap. Haying has begun and there is prospect of a good crop. Not many early potatoes are planted and all potatoes are looking slim. There is no decided change as to yield and price of market-garden crops. Dairy products show no change in quantity or price; price of cows has advanced 25 per cent. Pasturage is in very good condition and there is plenty of feed. Strawberries abundant, currants and gooseberries a very good crop. It has been too wet for beans, but they are doing well now.

Acushnet (M. S. DOUGLAS). — Potato bugs are doing some damage. Corn is backward, with about average acreage. Haying has been done and the crop will be as large as was ever known. The acreage of early potatoes is fully up to the average and they are looking well. Price and supply of dairy products and dairy cows about as usual. Pasturage never was better at this season of the year. Currants good, raspberries fair, blackberries will yield abundantly; strawberries not quite up, owing to blight, and prices low.

PLYMOUTH COUNTY.

West Bridgewater (C. T. HOWARD).—Canker worms are doing some damage. Very little Indian corn is planted, except for the silo. Some have begun haying, but it will not generally begin until about the 25th. More potatoes planted this year than usual, but the crop did not come up well. Early market-garden crops have been in good demand and brought fair prices. Milk is plenty, more than is needed for retail; price on No. 1 cows higher than formerly. Pastures are in good condition. Strawberries are plenty and apples promise well. There is a great amount of old hay on hand.

Hanson (F. S. THOMAS).—Squash bugs and potato bugs are doing some damage. Indian corn is looking well, with about the usual acreage. Haying is well under way and the crop is good. The acreage of early potatoes is about the same as usual and the prospect for the crop is good. There is no special change in regard to dairy products or dairy cows. Pastures are in good condition. The outlook for apples is good. There is not as much market gardening done here as formerly. It was overdone, and many went out of it altogether.

Pembroke (NATHANIEL MORTON).—Insects are doing no particular damage. Indian corn is backward at present. Haying is just beginning; crop good, nearly equal to last year. The acreage of early potatoes is less than usual and the crop is backward. The early market-garden crops are about the same as usual in yield and price. No particular change in dairy products or dairy cows. Such pasturage as there is is fairly good. Apples are not as promising as expected. The abundance of rain has not improved the agricultural outlook, except in grass.

Halifax (G. W. HAYWARD).—Potato bugs are doing some damage. Indian corn is looking backward; acreage about the same as usual. Not much haying done as yet, but there will be a heavy crop. More potatoes planted than in previous years and there will be a fair crop. Strawberries are plenty and cheap. Quantity of dairy products about as usual, also price; cows same price as formerly. Pastures are in excellent condition. Prospect for apples good; pears fair; no peaches; all berries plenty.

Lakeville (ELBRIDGE CUSHMAN).—As yet we are remarkably free from insects. Indian corn is looking fairly well, with about the usual acreage. Haying has begun and the prospect for the crop is good. Acreage of early potatoes fully average; plants not as vigorous and stocky as some years. Yield of early market-garden crops fair; prices low as a rule. Dairy products are above the average in quantity. Pastures are in good condition. Strawberries are abundant; apples and pears good; no peaches.

Wareham (A. B. SAVARY).—Very few insects as yet. Corn is backward; acreage about as usual. Haying has just begun and the crop will be large. The acreage of early potatoes is about as usual and they are looking very well. Early market-garden crops are backward, but are looking well. Quantity and price of dairy products and supply and price of dairy cows are about as in former years. Pasturage is in excellent condition. There is a large crop of strawberries. Blackberries and raspberries are looking well.

BARNSTABLE COUNTY.

Bourne (D. D. NYE).—Tent caterpillars are doing some damage. Indian corn is looking finely, with about three-fourths the usual acreage. Haying has commenced, with a good crop, but grass is somewhat lodged in some places, owing to wet weather. Potatoes look well, but the

acreage is very small, as compared with previous years. Early vegetables look well, prices well up and prospect for later ones good. Dairy products compare favorably with former years in quantity and price. Pastures never looked better. Strawberries not quite as good as last year, but look finely; a few blackberries; raspberries doing finely.

Sandwich (J. R. HOLWAY).—Fire worms are doing some damage. Corn looks fairly well, with about the usual acreage. Haying has begun, with a good crop. The acreage of early potatoes is increased and they are looking well. Very little butter is made and not much milk; cows plenty, prices average. Pasturage is in good condition. Strawberries are a good crop and the outlook for blueberries is good.

Mashpee (W. F. HAMMOND).—Cut worms, potato bugs and fire worms are doing some damage. Indian corn is looking very well; acreage above the average. Haying has begun and there will be above an average crop. Acreage of early potatoes about average with previous years and there bids fair to be a large crop. Market-garden crops are below the average in yield, with about average prices. Quantity of dairy products below average, prices about average; supply and price of dairy cows below the average. Pasturage is in very good condition. Gooseberries, currants, blackberries, raspberries and strawberries are all looking well.

Dennis (JOSHUA CROWELL).—Corn is backward, and I think the acreage is less than usual. Haying has begun, with the prospect of a larger crop than usual. Acreage of early potatoes about average, with the promise of a fair crop, although some failed to come up. Early market-garden crops are about average as to yield and price. Quantity and price of dairy products about as usual. Pastures are at present in very good condition. Fair crop of strawberries; apples and pears not very well fruited; too early to predict as to cranberries.

Eastham (J. A. CLARK).—No particular damage from insects. Very little Indian corn is planted. Haying has begun on high land, with the prospect of a good crop. Acreage of early potatoes about average; crop looking well, but later than usual. Dairy products are average as to quantity and price. Pastures are in good condition. Asparagus is the only crop marketed to date; crop thought to be one-fourth less than last season, owing partly to cold weather and partly to the rust of last season.

Truro (D. E. PAINE).—Potato bugs and white grubs are doing some damage. Very little Indian corn is planted. Haying has begun, with very good prospects. Quantity of early potatoes about the same as last year and prospect for the crop good. Prospect for market-garden crops very fair. There is no difference to note as regards dairy products and dairy cows. Pasturage is in better condition than usual at this time of year.

DUKES COUNTY.

West Tisbury (GEO. HUNT LUCE).—Squash bugs, potato bugs and tent caterpillars are doing some damage. Indian corn is looking fairly well; acreage about average. Haying has not generally begun, but the prospect for the crop is good. Acreage of early potatoes about the same as usual, but the crop is backward. Dairy products are about average both in supply and price; price of cows about average. Strawberries a small crop, with some complaint of blight.

BULLETIN OF MASSACHUSETTS BOARD OF AGRICULTURE.

THE SAN JOSÉ SCALE IN MASSACHUSETTS.

By A. H. KIRKLAND, M.S., *Assistant Entomologist.*

The presence of the San José scale in Massachusetts was first recorded by Prof. C. H. Fernald, entomologist to the Board, in the Massachusetts Crop Report for August, 1895. The insect had then been found colonized in five localities in the State. At the present writing thirteen localities are known to be infested, and from the recent rapid increase of the known occurrences of the insect it is evident that we are just beginning to realize the extent to which this pest has been disseminated throughout the Commonwealth. During the past three years the writer has had opportunities to become familiar with several colonies of the scale in eastern Massachusetts, and, at the request of Secretary Wm R. Sessions, has attempted to combine the notes thus made, supplementing them with extracts from the writings of others, particularly in those portions relating to the life history of the insect and remedies available for treating infested trees. It should be stated at the outset that the study of this important insect has received the attention of our leading economic entomologists; and, as a result of the careful work of Messrs. Howard Marlatt, Smith, Webster and others, we may now easily obtain an accurate knowledge of the history and habits of the insect, its means and routes of distribution and the remedies best adapted to destroy it. Entomologists are especially indebted to Dr Howard and his assistants for the exact information concerning the life history of the scale, as published in Bulletin 3, New Series, Division of Entomology, 1896, a work that has been the basis of the majority of the treatises on the subject appearing since that date.

DISTRIBUTION.

The original home of the San José scale is yet a matter of conjecture. It is known to occur in Chili, Hawaii, Australia and the United States, while two varieties of the species have been found upon trees coming from Japan. The occurrences of the scale in Chili and Hawaii have been practically traced to the United States; the Australian infestation is thought to have been brought from Japan; and Professor Cockerell, our leading authority on this group of insects, is quite certain that the latter country will ultimately prove to be the original home of the pest.

In the vicinity of San José, California, from which place the insect takes its common name, the scale was quite injurious as early as 1873; and, when described by Professor Comstock in 1880 as "the most pernicious scale known in the country," it had become destructively abundant throughout a considerable part of the fruit-growing region of that State. Since the insect primarily appeared as a pest to fruit trees, its dissemination upon nursery stock soon followed. According to the statement of a member of the firm of Stark Brothers at the Indianapolis meeting of the American Association of Nurserymen in 1895, the first consignment of infested trees to reach the eastern United States was shipped in

the spring of 1887 from a Californian firm to the Parry and Lovett nurseries of New Jersey, the firm of Stark Brothers acting in this case as transmitting agents. From these New Jersey nurseries as starting points, many of our eastern nurseries became infested, thus increasing the number of centres of distribution. Many orchards throughout the country also became infested with the scale as a result of the direct purchase of stock from these nurseries.

While it is generally conceded that 187 marks the date of the first importation of the scale to the east, a case has recently come to the writer's attention that would indicate the possibility of the occurrence of the San José scale in a Long Island nursery at a date somewhat earlier than that of the New Jersey infestation, and possibly as a result of the direct importation of trees from Japan. The facts are these:—

In the vicinity of Boston there is an educational institution where particular attention is given to the study of trees and shrubs. On the grounds of this institution there is a colony of the San José scale which is confined in great measure to a plot of perhaps thirty Japanese quince bushes. These bushes, according to the testimony of those in charge of the grounds, "have been infested for many years." Careful records of all trees planted are kept by the authorities of the institution, and in this case the records show that the bushes in question were purchased from three sources: the firm of James Veitch & Sons, London, England, in 1861; Louis Späth, Rixdorf, Berlin, Germany, in 1888; and the Parsons & Sons Company, Flushing, Long Island, in 1884. The greater part of the bushes were obtained from the latter source, and these are infested to the greatest extent, although the scale occurs on all of them. The infestation of this nursery for many years past is a matter of common knowledge among entomologists and nurserymen; also the fact that this nursery has paid especial attention to the importation and distribution of Japanese stock. Unfortunately, all of these Japanese quinces were grown for one season in a very compact plot, and their infestation is so general that it is impossible to decide which were the ones originally infested. From an inspection of the grounds it is evident that these bushes are the centre of infestation in this colony: and, unless it is shown that the English and German nurseries are infested, of which there is no evidence at present, the natural inference is that the Long Island nursery is the source from which the infested stock was obtained, thus antedating the New Jersey occurrence by about three years. Against the conclusion that the Long Island stock was the source of the scale at this particular locality may be placed the length of time elapsing since its purchase.—some fourteen years. The time required for the killing of trees by the scale is placed by Messrs Howard and Marlatt at from two to three years. In the south where the active season of the insect is longer than it is here, and the warmer climate more favorable to its multiplication, undoubtedly this may be the case. It is also probable that a longer time is required for the destruction of trees from this cause in this region; for we have records of an apple orchard at Scituate, Mass., planted in 1892 with infested trees two or three years old, of which about ninety per cent. although very badly affected, were alive in 1897, at which time remedial measures were applied. Since a Japanese quince with vigorous roots will throw out an abundance of new shoots year after year as the old wood dies off, the continued infestation since 1884 of the bushes previously mentioned does not seem beyond the limits of possibility.

In a recent bulletin Dr Howard gives the present distribution of the San José scale in the United States as follows:—

Alabama, Arkansas, Arizona, California, Connecticut, Delaware, District of Columbia, Florida, Georgia, Idaho, Illinois, Indiana, Kentucky, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Nevada, New Jersey, New Mexico, New York, North Carolina, Ohio,

Oregon, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, Washington, West Virginia. It has also been found in British Columbia and Ontario, Canada.

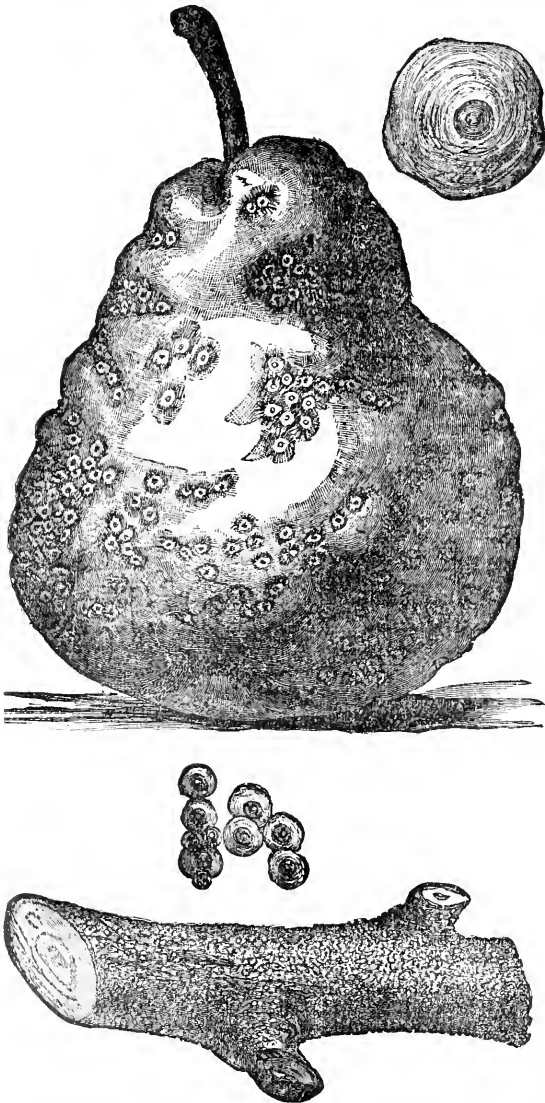


FIG. 1. Pear infested with San José scale (*Aspidiotus perniciosus*), and enlarged female; infested twig, and enlarged males. From Howard, Year Book, U. S. Department of Agriculture, 1894.

In the same bulletin Dr Howard gives a list of the infested localities in Massachusetts as furnished him by Professor Fernald. It includes: Amherst, Bedford, Brookline, Cambridge, Jamaica Plain, Reading, Roslindale, Scituate, South Chelmsford, South Framingham, Worcester,

To the above list Professor Fernald now adds Auburndale and Belchertown, while the writer has recently discovered a limited occurrence of the scale in Malden.

As is well known, the principal method by which this insect has been disseminated throughout the country is through the sale of infested nursery stock. Without doubt local distribution is facilitated by birds and insects. The young lice, although minute, are active, and, readily crawling upon the feet of birds or the bodies of insects, may be transported to a considerable distance. In an infested orchard large numbers of the scale usually will be found under and around birds' nests; and, when examining trees for the scale, those in which birds' nests are located should receive the most critical attention.

DESCRIPTION OF THE INSECT.

When the San José scale is abundant, its presence is soon betrayed by its effect upon the trees. Infested trees are usually stunted, do not put forth vigorous foliage and make but little growth. An examination of such sickly trees frequently results in the discovery of multitudes of the minute, dark-gray, circular or slightly oval scales massed on the trunk and older branches, while the younger growth is thickly dotted with single scales. The scales are often so numerous on the trunk as to make a thick, scurfy crust, that may be removed in a layer. While most commonly found on the bark, they also occur on the fruit and leaves. The writer has found this insect abundant on the fruit of the Japanese quince, and in a single orchard on apples and pears. When the scales occur on the fruit or young growth, they are often bordered with a purplish margin of discolored tissue. On the bark beneath the scales a similar coloring is found; but this peculiarity is not confined to the San José scale, since the scurfy bark louse sometimes produces the same effect. This discoloration of the bark, however, is of considerable assistance in the recognition of the San José scale in the field.

The nearly mature insects winter over beneath their scales, and complete their growth early in the spring. During a period of about six weeks the females give birth to several hundred young, and at the end of this time the first-born insects are mature. The young larvæ, after escaping from beneath the female scales, appear as a fine, yellowish dust on the bark, and swarm over the tree in search of a suitable settling place. Having become fixed, they insert their beak into the bark, secrete a scale, and soon become like their parents in appearance and capacity for damage. The active season of the insect is doubtless shorter in Massachusetts than it is farther south. Accurate information on this point is lacking. On May 21, 1898, I found young larvæ abundant on a badly infested, purple-leaved prune at Cambridge, Mass.; while at Auburndale, Mass., Oct. 9, 1897, a few days after a light frost, infested peach trees were swarming with the young lice. This shows us that here the insect multiplies throughout a season of over four months.

By isolating female scales on small trees, Messrs. Howard and Marlatt found the number of young borne by a single female to vary from thirteen to five hundred and eighty-seven; and, assuming four hundred young to be a fair average, these gentlemen find that in the course of a single summer one female might become the parent of over three billion progeny. When one contemplates the remarkable rapidity with which this insect multiplies, — a brood of about four hundred every six weeks, — what wonder is it that in the space of two or three seasons this prolific pest is able to spread over even large fruit trees? The lapping over of the different generations is one of the greatest hindrances to the successful use of insecticides against this insect. With many of our scale insects the young appear at known intervals of time,

and the use of a suitable contact insecticide at the proper time will insure the destruction of the whole brood. Not so with the San José scale. Such a wash, to be effective, would need to be repeated daily for perhaps six weeks in order to destroy the young born at different intervals.

The two scales most commonly met with in the orchards and nurseries of the State are the scurfy bark louse and the oyster-shell bark louse, and these two insects are the ones most frequently mistaken for the San José scale. The figures given so well illustrate the characteristics of these scales that detailed description is unnecessary. The scurfy bark louse (Fig. 2) is common on trees of the apple family and on currant bushes. It is compact, slightly elongate, thin, and usually of a light, dirty-gray color. The oyster-shell bark louse (Fig. 3) also occurs on the apple, pear, etc., and on ash, willow, and poplar as well. This insect differs from the preceding species in that the scale is more elongate, and usually curved. The molted skin of each insect forms a protuberance at its apex. In Massachusetts these two insects are seldom dangerously injurious, and when over-abundant may be destroyed by the application of simple remedies.

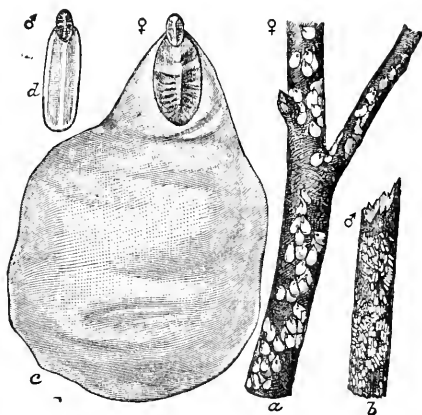


FIG. 2. Scurfy bark louse (*Chionaspis furfurus*): a, c, females; b, d, males; a, b, natural size; c, d, enlarged. From Howard, Year Book, U. S. Department of Agriculture, 1894.

The San José scale (Fig. 1) is distinguished from the preceding insects by its nearly circular outline, its dark-gray color and the nipple-like projection at its centre, as shown in the illustration. The male scales are more numerous and are smaller and darker than the female scales, bearing a distinct white dot in the centre of the protuberance. The farmer should be able to distinguish between these three scales without the aid of a lens. Unfortunately there are a few species of circular scales closely resembling the San José scale, for whose separation the use of a compound microscope is a necessity. The safest course for the farmer who finds suspicious-appearing scales on his trees is to send a piece of the infested bark or twig direct to the Experiment Station at Amherst, where experts will gladly make a careful examination of the material, and inform the sender of the nature of the insect. Suggestions concerning remedies, where the latter are deemed necessary, will also be furnished.

FOOD PLANTS.

The San José scale flourishes on a wide range of food plants, and in this fact we see another reason to fear the spread of the pest. Where infested nurseries are located near woodlands, it is highly probable that the latter will eventually become infested, and the eradication of the insect in such a locality would be almost an impossibility. In this State the San José scale has been found on the pear, apple, *Pyrus nigra*, *Pyrus heterophylla*, plum, cherry, peach, apricot, nectarine, purple-leaved prune, quince, Japanese quince, rose, currant, grape, American elm, European elm, balm of Gilead, willow and catalpa. Elsewhere it is known to attack spirea, maple, walnut, birch, etc. Dr. Howard's

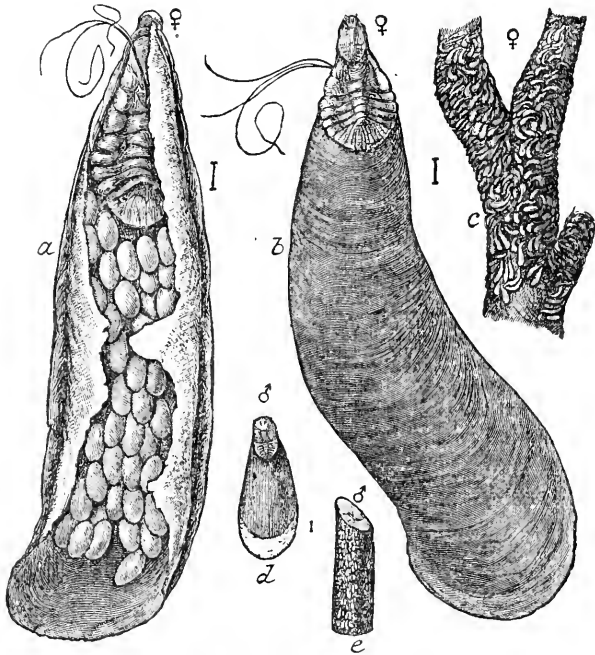


FIG. 3. Oyster-shell bark louse (*Mytilaspis pomorum*): a, female scale from below, showing eggs; b, female scale from above, both figures greatly enlarged; c, female scales; d, male scale, enlarged; e, male scales on twig, natural size. From Howard, Year Book, U. S. Department of Agriculture, 1894.

latest list of the food plants of this insect includes fifty-five species. From this list it is evident that the insect is capable of adapting itself to nearly all of our deciduous trees.

NATURAL ENEMIES.

Several parasites of microscopic proportions have been reared from the San José scale in the south and west, but, so far as the writer has been able to learn, none have been recorded from this State. Professor Rolfs of the Florida Experiment Station has given much attention to a fungous disease that has appeared in the colonies of the scale in the south, and finds that it is of considerable assistance in checking the increase of the insect. Samples of the fungus sent to Dr. J. B. Smith,

New Brunswick, N. J., were transplanted on infested trees with only slight success. In Massachusetts the only natural enemies recorded are two species of lady-birds, found by the writer at Auburndale, Mass., Oct. 9, 1897. On a single badly infested peach tree there were two representatives of one species* and eight of another,† all feeding on the young scales.

REMEDIES.

The degree of the infestation and the location and age of the infested stock are among the chief considerations affecting the nature of the remedies to be used. Aside from the matter of fumigation, which will be detailed later, the same remedies are equally applicable to the orchard and the nursery.

1. *Burning* — In treating orchard or nursery stock infested with the San José scale, the destruction of the trees, root and branch, by fire, will in the end yield the most satisfactory results. Financial or sentimental considerations may sometimes induce the owner to employ less heroic measures, and remedies for use in such cases are described later. In preparing the trees for burning, it is necessary to dig rather than cut them. This is essential because the scales frequently mass on the bark below the surface of the ground, and, sheltered in the cavity made by the swaying trunk, multiply undisturbed. Professor Webster has noticed that shoots sprouting from such stumps are usually infested, thus showing the necessity of destroying the stumps as well as the trunk and branches. As a measure of safety, it is necessary to burn not only the infested trees but also those adjacent. Where infested stock has been grown for a season or more in proximity to other trees it will almost invariably be found that the insect has spread to some distance beyond its original confines. Aside from the greater degree of safety secured, the destruction of suspicious stock will save the time and labor that must otherwise be spent in watching for the development of the scale on these trees, and in combating it should it appear. In all cases where the infestation is of recent date and limited in extent, the use of fire is the only measure that should be adopted.

2. *Whale-oil Soap*. — The value of this substance as a remedy for the San José scale was brought to public attention in 1896 by Messrs. Howard and Marlatt, and thus far has given uniformly satisfactory results as a palliative measure. It is applied at the rate of two pounds to one gallon of water as a winter wash only. The soap is cut into small pieces, dissolved in hot water, and, while warm, applied in a spray to the infested trees, or the trunks and branches may be first scrubbed and later sprayed. A boiler or kettle holding from five to fifteen gallons is a necessity for work in the field. Small trees need but little preparation for the treatment, but large trees should be well trimmed and cut back before spraying. A single winter washing of the trees, as outlined above, will destroy nearly all of the scales. It is safer, however, to follow the first treatment with a second at an interval of a month or more. These applications may be made at any time between November 1 and April 1.

Much has been claimed for the whale-oil soap treatment, and up to the present season the writer was of the opinion that in this remedy we had a measure that was nearly if not quite exterminative in its effects. A few tests of the remedy are cited below. —

An apple orchard located in the town of Scituate was visited on March 2, 1897, and was found to be badly infested with the scale. The trees were planted in 1892, and at the time of the writer's visit three or four were dead, twelve were so badly infested that they were ordered

* *Adalia bipunctata*.

† *Chilocorus bicutnerus*.

burned, and fifty-nine out of a total of one hundred and six were generally infested with the scale. The orchard being somewhat isolated and the owner unwilling to burn all the trees, the whale-oil soap treatment was recommended, and was applied a few days later. A careful examination of the orchard Aug. 27, 1897, showed only about half a dozen living scales. Another examination on June 11, 1898, showed many scales on last year's growth, although nearly all of those examined were dead, a result of another treatment with the soap solution during the past spring. The trees are thrifty and are making good growth, yet it is evident that the scale is still present, and that remedial treatment must be kept up for some time.

In the spring of 1897 the writer personally treated a block of young infested pear trees with whale-oil soap and water at the rate of two pounds to one gallon. June 7, 1897, no scales could be found on the trees, which during the fall of 1897 were dug and "heeled in," preparatory to shipment. An examination of these trees Dec. 13, 1897, showed them to be generally infested with the scale. In this case, sources of infestation were found later near by, yet other stock growing between the pears and the infested spots was apparently free from the scale. I am forced to conclude that a few scales survived the treatment, and by fall their progeny had multiplied sufficiently to reinfest the trees.

At Auburndale, Mass., a number of badly infested currant bushes were thoroughly drenched with the soap solution on Oct. 9, 1897. At that time the bushes appeared to be nearly dead. When last examined, June 11, 1898, they had made a vigorous growth and were in a remarkably thrifty condition. At the same time a few living scales and a few young larvæ were found, showing that the treatment, while reducing the numbers of the scale to a minimum, had not entirely exterminated the insect.

A proper interpretation of the above-described experiences is that in whale-oil soap applied as directed we have a valuable means for checking the increase of the scale, and by its use infested trees may be restored to a thrifty condition. This remedy cannot be depended upon to exterminate the insect; and, in view of the cost of annual treatments, the question to be considered is, Will it not be cheaper in the end to burn the infested stock and start anew with trees free from the scale?

3. *Kerosene*.—Recently, through the efforts of Professor Webster and Dr. J. B. Smith, the value of pure kerosene as a remedy for this insect has been extensively tested. The results thus far obtained, while uneven, have been on the whole satisfactory, and Dr. Smith has even advised owners of infested trees to use kerosene in preference to other remedies. He advises that during the month of September the oil be applied as a very fine spray, and that only an amount sufficient to moisten the surface be used. The trees must be perfectly dry, and the time for treatment the middle of a warm, sunny day. When used as above directed, kerosene has been found to kill all of the scales, usually without injury to the trees except in the case of the peach and plum. In some cases, however, other species of trees have been destroyed, and at the present writing farmers are not advised to make a general use of this remedy until they have first tested it experimentally.

4. *Fumigation*.—This method is particularly valuable to the nurseryman. The trees to be treated are loosely packed in a tight room, and exposed to the fumes of hydrocyanic acid gas for a period of forty-five to sixty minutes. This gas is liberated by the action of acid on cyanide of potash in water. The necessary quantities of the ingredients for one hundred and fifty cubic feet of space are: cyanide potash (ninety-eight per cent.), one ounce; sulphuric acid, one ounce; water, three ounces. The cubic contents of the fumigation house are computed, and the necessary amounts of chemicals prepared. The water and cyanide are placed in a suitable earthen dish such as a bean-crock or other wide-

mouthed receptacle, and when all is ready the acid is poured into the mixture and the doors closed for the time indicated. Before removing the trees the chamber must be allowed to ventilate, since the gas is fatal to human as well as insect life.

A simple yet effective fumigation house built by one of our nurserymen consists of a double-boarded building, ten feet wide and thirty feet long. In this building there is a chamber ten by twenty feet for the fumigation of large quantities of stock or of tall trees, while two smaller chambers, five by ten feet, afford means for fumigating shrubs and small trees. After the fumigation house has been erected, the labor in handling the stock is the chief item of expense. Cyanide of potash costs thirty-eight cents per pound in quantity, and sulphuric acid less than two cents per pound. Professors Alwood of Virginia and Johnson of Maryland have had extensive experience in fumigating nursery stock, and both find that when properly conducted the fumigation treatment is an exterminative measure. From the testimony of many experts it is evident that in fumigation we have the best-known means of insuring the freedom of nursery stock from the scale.

THE NURSERY QUESTION.

Of all problems connected with the occurrence of the San José scale in Massachusetts, the nursery question is the most difficult. The public in general and farmers in particular feel themselves entitled to the knowledge in the possession of official entomologists concerning the condition of various Massachusetts nurseries. They argue, and with much force, that as servants of the public these experts should protect people from purchasing infested stock by definitely stating what nurseries are or have been infested with the San José scale. On the other hand, it would appear only just to respect certain rights of the nurserymen. No nurseryman has purposely infested his nursery with the scale. It is in every instance an accident, a calamity. This being the case, nurserymen feel that their misfortunes should not be increased by publicity, so long as they are properly discharging their obligations to the public. In fact, some of our nurserymen contend, judging from the experience of their fellows in other States, that the announcement that their nurseries had been infested with the scale might ultimately ruin their entire business.

Desiring to deal fairly with the farmer and nurseryman alike, the writer has come to the conclusion that no public good will result from the specific mention of the occurrences of the scale in the State, except in cases where there has been either an obvious attempt to defraud the public or gross negligence exhibited in producing and sending out infested stock. In cases of the latter class, it would seem to be plainly the entomologist's duty to aid so far as possible in checking the spread of this most pernicious pest.

Nurserymen may be separated into two classes,— the reputable and the disreputable. The one endeavors to maintain a high standard for his stock, and grows and sells only first-class trees. The other may disregard all obligations of common honesty, and sell stock, regardless of its condition, to all who will buy. Reputable nurserymen, finding their places infested with the scale, endeavor in all ways to eradicate it. Those of the other class throw their infested stock upon the market, with the result that hundreds of innocent purchasers are victimized, and the pest becomes established in hundreds of new localities. To the credit of this State let it be said that the Massachusetts nurserymen who have been called upon to combat the scale as a rule have shown that they fully appreciate the importance of dealing with it promptly and thoroughly.

About a year and a half ago all the larger Massachusetts nurseries were examined. The scale was found to occur in three of these nurseries, and last spring another was added to the list. Only one was infested to any considerable extent. In one case the nursery became infested through Japanese plums bought from a New Jersey source. The scale at this place was discovered by the writer during the fall of 1896, and at the time his inexperience in combating the insect led him to advise the destruction of only such trees as were found infested. The failure of this course of action was shown in the summer of 1897, when an extension of the colony was found on trees adjacent to the ones destroyed. Profiting by the experience, all the trees over a large area around the infested spot were sacrificed, with the result that an examination made in the fall of 1897 and another during the present month failed to reveal the presence of the scale.

In another case a limited infestation was found on Japanese quinces received as a gift from the educational institution previously referred to. The nursery owner, as soon as the facts of the case were known, at once destroyed, under the writer's supervision, not only all the infested bushes, but large blocks of apparently non-infested fruit and shade trees standing near by. Finally, a large fumigation house containing three chambers was built, and in it has been treated all stock bought and sold since the discovery of the scale on the premises Feb. 9, 1898. An examination of this nursery was made June 18, 1898, and no San José scale was found.

In a third nursery, Mr. Robert A. Cooley, assistant entomologist to the Hatch Experiment Station, in 1897 found a limited occurrence of the scale on trees bought from another Massachusetts nursery that was known to have been infested for some time. In this case infested and suspected stock was burned, and all the trees in the vicinity were given a liberal application of whale-oil soap solution. A fumigation house was erected, and in it all stock sold since that time has been treated. A subsequent inspection showed the presence of a few scales, when more of the stock was burned; and at a recent inspection, June 14, 1898, Mr. Cooley informs me that he was unable to find a single San José scale.

There is one nursery in this State that should receive both praise and blame; and, that there may be no misunderstanding, the writer will state that he now refers to the Shady Hill nursery located at Bedford, Mass. This nursery doubtless became infested from the older nursery of the same name located at Cambridge, Mass. I was informed by Mr. Pratt, a member of the firm, that the original infestation of the Cambridge nursery took place through the introduction of infested stock from Trenton, N. J., in 1890 or 1891. Mr. C. P. Lounsbury found the San José scale abundant at the Bedford nursery in 1895, and, from the frequency with which the occurrences of the scale in various parts of the State were traced to this nursery, it became evident that it was, doubtless unintentionally, disseminating the insect to a considerable degree. The matter was brought to the attention of the firm by Professor Fernald in 1895, and I am informed that as a consequence a number of infested trees were destroyed. The general infestation of the nursery continued, however, until the spring of 1897, when an honest attempt was made to eradicate the pest. Under the writer's supervision, on April 16 and 17 all known infested and all suspected trees (some six thousand in number) were dug and burned, and, as a precautionary measure, the soap solution was applied to several hundred apparently non-infested trees. The building of a fumigation house was recommended to the owners, and, while this was not done, it should be conceded that at this time the firm made great pecuniary sacrifices, and did all in human power to destroy the scale on trees standing in their nursery. As a result of this treatment, a hasty examination made in

June, 1897, failed to reveal the presence of a single San José scale. However, examinations made Dec. 13 and 18, 1897, at the request of the firm, showed that infested areas of limited extent had developed in the nursery, although the total infestation was not more than ten per cent of that found the previous spring. These infested areas, as well as a large number of infested apple and pear trees "heeled in" ready for sale, were pointed out to members of the firm, who accompanied me, and assurances were given that all the trees indicated to them as infested or suspected to be infested would be burned as soon as the ground thawed. The matter of a fumigation house was again brought to their attention, with the result that it was decided to build one before the shipping season.

In strong contrast to the vigor and thoroughness with which this firm in 1897 began the treatment of their nursery for the scale was the negligence exhibited during the past spring. On April 7, 1898, I visited the nursery, and found that the shipping of stock had commenced, the station agent at Bedford, Mass., informing me that some eight or ten carloads had already been shipped. The lumber for a fumigation house was on the ground, but nothing had been done toward building. In the nursery the infested apple and elm trees that I had condemned Dec. 18, 1897, were in great part still standing, although occasional vacancies in rows showed where trees had been dug. The disposition made of the latter trees I do not know. On June 15, 1898, another inspection showed that the infested elms were still standing in the nursery. A fumigation house had been built, but apparently used but little. One of the employees of the firm informed me that the building had been used to treat some trees bought recently; another employee stated that it had not been used except as a store-house. Be this as it may, this firm has this year been guilty of gross carelessness in allowing known areas of infested trees to exist unmolested in its nursery, and it would seem highly probable that more or less infested stock may have been sold. This firm also controls the old Shady Hill nursery at Cambridge, Mass. which, although practically abandoned, still contains a large number of trees. Here a colony of the San José scale has been allowed to remain for several years, although its presence has been repeatedly mentioned to the firm, with the recommendation that the infested trees be destroyed. In the case of this nursery the writer believes that public interests will be best served by a fair statement of facts, and this he has endeavored to make.

LEGISLATION.

The occurrence of the San José scale in a nursery or orchard is a constant menace to the fruit and shade trees in the vicinity, and when neglected should be classed as a public nuisance. Being a nuisance, it becomes a proper subject for legislation. Lacking national laws on the subject, many States have enacted statutes whereby the treatment of infested trees is made mandatory upon the owner, and the sale of infested stock a criminal offence, punishable by fine. In some States nursery stock coming from another State will not be admitted unless accompanied by a certificate of freedom from dangerously injurious insects and diseases, issued by the entomologist of the State from which shipment was made. Germany has gone a step farther than this, and, by the edict of Feb. 5, 1898, prohibited the importation of American nursery stock or fruit.

So far as the nursery question in this State is concerned, Professor Fernald has steadily held to the idea that the laws of trade are more potent than those framed by legislators; that the man who deliberately sells infested trees will eventually lose his reputation and patronage, while the reputable dealer will ultimately be well repaid for all sacri-

fices made to maintain the high standard of his stock. The soundness of this view of the case has been demonstrated by the action of the nurserymen of this State who voluntarily have gone to the expense of having their nurseries examined by experts, have destroyed thousands of trees, and have erected fumigation houses for the treatment of all stock bought or sold. This they have done not through fear of punishment, but in order to protect themselves and customers, and to retain public confidence in the character of their stock. With nurserymen so wide awake to their own interests, it would seem that legislation to compel them to clear their places from the scale, should any occur, would be unnecessary.

There is, however, another side to the case. Several years may be required to teach an unscrupulous dealer the old lesson of the value of honesty in business dealings, and in the mean time he may have been sending the scale broadcast throughout the State, working incalculable injury to hundreds of orchardists and property owners. Again, there may be nurserymen with no reputation to lose, who depend for their income upon sales to tree peddlers and to new customers, and who will not hesitate to unload in the market any infested stock they may possess. In either case, a law to provide means for the detection and punishment of such offences would work a benefit alike to the public and reputable nurserymen. Another contingency should also be considered. A careless or malicious property owner might allow badly infested trees to stand on an estate adjoining a nursery or an orchard. No matter how carefully and thoroughly the nurseryman or orchardist might labor to maintain the freedom of his trees from the scale, such a result would be almost an impossibility until the original source of infestation had been stamped out.

The issuing of certificates to nurserymen whose stock is found to be free from the scale as yet has not been authorized by law in this State. Since nurserymen are the ones who will benefit most by legislation against the San José scale, the matter of securing such legislation is one in which they may properly take the initiative.

SUGGESTIONS TO NURSERYMEN.

In order to hold the trade of his patrons, a nurseryman must list a wide range of trees and shrubs, many of which cannot be grown in his locality, and for which he must depend upon other dealers. Remarkable as it may seem to those not familiar with the facts, our Massachusetts nurserymen are unable to raise apple trees in competition with those grown in New York, Ohio, Pennsylvania and other States, where climatic and soil conditions are more favorable to the rapid growth of the young trees. Yet in the matter of evergreens and many other shade trees our nurserymen supply the needs of others less favorably situated. Thus each nurseryman is largely dependent upon his fellow tradesmen for a considerable part of his stock; and, this being the case, infested trees are often unwittingly disseminated, since it is impossible, in the rush of the shipping season, to open and carefully examine all the stock received before using it in filling orders. There are, however, certain precautions which all nurserymen may adopt, and thus reduce the chance of receiving and disseminating infested stock. Among them are:—

1. *Dealing with Reputable Firms.*—There are certain nursery companies whose dishonesty in sending out stock falsely named or badly infested with the scale has made them notorious. Their disreputable business proceedings are matters of common comment among nurserymen with whom I have conversed, and yet I have frequently found that many of our Massachusetts growers have purchased stock from these firms within recent years. For example, a certain New Jersey firm has

for a long time been recognized as one of the chief offenders in sending out infested trees, yet many of our nurserymen annually risk the safety of their nurseries by trading with this firm. The stigma of selling infested stock comes upon the one who makes the final sale, and in dealing with disreputable firms the nurseryman takes the chance of being classed with them.

2. *The "Refuse" Garden.*—In some of the nurseries which the writer has visited he has found a certain area of land set apart and dedicated to the use of refuse stock. Here are assembled the pariahs of the nursery world. Here dwarfed, misshapen and diseased trees are set out to live or die, as the case may be. Here all kinds of nursery pests flourish unrestricted, and from such a centre they spread out and infest the nursery. Here, also, tree peddlers and bargain hunters find and obtain their *bargains* in trees. In one case coming under the writer's personal observation such a refuse garden contained the "culls" and outcasts of three abandoned nurseries, as well as the refuse stock of four or five years' accumulation from a large active nursery. Out of about a thousand trees, over one-half were badly infested with the San José scale. Such a pest spot in a nursery is a menace to all stock standing on the grounds. To the owner it also offers a temptation to sell inferior trees. The oldest nurseryman in Massachusetts in conversation on this point once told the writer that in his experience, extending over nearly fifty years, he had found it "the best policy to destroy at once all trees found to be sickly or diseased." In view of the frequent occurrence of the San José scale on such stock, the wisdom of this policy is evident.

3. *The Annual Inspection.*—The San José scale is most difficult of detection when present in small numbers. When it is abundant in a nursery or in an orchard, the limits of the infestation are equally difficult of definition. This work is one that calls for the services of the entomologist, and the careful inspection of the trees by such an expert should give the grower a fairly accurate idea of the condition of the stock as regards the San José scale. Too much should not be expected from the entomologist, since no one can positively declare a nursery to be free from this insect. When we consider that several scales might be concealed beneath a single bud, the difficulty in making such a positive statement is evident. The entomologist, however, should be able to detect any well-defined infestation, and, by advising the use of proper remedies, aid the owner in stamping out incipient colonies of the insect. This examination can be made to the best advantage during the season when the trees are bare. The trees may be examined either before or after "heeling in."

4. *Fumigation.*—This has been described under the head of remedies. At the present time we believe thorough fumigation to be the great safeguard against the introduction and dissemination of the scale. Experiments by Professors Alwood and Johnson, as well as by Dr. Howard and others, have shown the possibility of destroying the scale by treatment with hydrocyanic acid gas. The cost of this treatment is but a small premium to pay for the insurance of the stock thus treated. Any one with a knowledge of the facts involved should be willing to pay a slightly higher price for fumigated stock, and the writer is of the opinion that the time is not far distant when fumigated trees will be at a premium. Certainly the nurseryman who destroys all his infested and suspected stock and then fumigates all the trees bought and sold has discharged his full duty to the public.

SUGGESTIONS TO PURCHASERS.

One can conceive of but few greater calamities that might befall a farmer than to have his trees become infested with the San José scale. The insect is most obscure and its attack most insidious; at the same

time, its powers of multiplication are phenomenal, and its spread is constant and certain where unrestricted or neglected. Expert entomologists who have attempted to eradicate this insect from orchards have found the problem an exceedingly difficult one. How much more difficult will be the proper treatment of the insect at the hands of the farmer, who in the majority of cases can avail himself of only a part of the resources in skill, remedies and appliances at the disposal of the entomologist? The farmer buys a few infested fruit trees, representing desirable varieties. In a few years some of the trees die. The farmer avails himself, perhaps, of the services of the experiment station officials, and finds that not only has the San José scale killed his young trees, but that from them a considerable part of his adjacent orchard or shade trees has become infested, and learns that only by constant care and outlay of money or its equivalent can these trees be preserved. This picture is not a creation of fancy. There are only too many duplicates in this State. The natural outcome of the unrestricted occurrence of the San José scale on a tree is the death of that tree and the infestation and death of adjacent trees. This is a fair statement of the case at the present time. In the south the fungous disease to which reference has been made has aided in checking the spread of the scale, while in California it is stated that parasites and predaceous insects have rendered a similar service. Until we know that such natural checks appear in this State, and are restricting the increase of the scale, we must depend upon such remedies as experience has shown to be successful, and upon them alone. There are, however, certain precautions indicated below which should be adopted by all purchasers of nursery stock, in order to prevent as far as possible the introduction of the scale.

1. *Buy First-class Stock.*—In buying trees, as well as in buying other goods, the habit of hunting for bargains will ultimately prove an expensive one. The dealer who has trees to sell at a price greatly below the usual trade rates usually has some potent reason for making the reduction. Cheap trees are usually “culs,” and are most liable to be infested with insect pests. Conversely, clean, thrifty stock, while higher in price, is least liable to harbor undesirable or dangerous insects. An abundance of such stock can be obtained from the nurserymen of this State. It may be well to emphasize the fact that it is more to the purchaser's advantage to trade with home firms, the condition of whose stock is known, than to buy from remote firms, whose grounds may never have been inspected. In this State, even, one would do better to buy from firms that have had the scale in the past, but on whose grounds none can be found at present, and who are fumigating all stock bought and sold, than to purchase from nurseries whose condition is unknown.

2. *Avoid Tree Peddlers.*—The writer would cast no aspersions on the legitimate agents of responsible and reputable firms. But there are those best described as “tree peddlers,” who go through the farming districts of the State selling trees alleged to possess marvellous fruit-bearing qualities, and delivering second or third class stock, obtained wherever it can be bought the cheapest. A common complaint from farmers and others who have dealt with this class of peddlers is that stock bought of them does not prove true to name. One familiar with their methods could hardly expect the case to be otherwise; and a man who will knowingly falsify the varieties of trees, probably would not be above selling diseased or infested stock for sound, healthy trees. There are plenty of reputable nursery firms in the State who will give the farmer's small orders the same care and attention paid to those of their largest patrons. Experience in tracing infested stock to its original source has shown that tree peddlers and middlemen have been largely responsible for the dissemination of the scale in this State.

3. *Buy only Guaranteed or Fumigated Stock.*—With the facilities now available for the examination of nurseries, there is no good reason

why any nurseryman in the State cannot have his place examined by competent experts, and be placed in a position to guarantee his stock free from dangerous insect pests. This end is best obtained by fumigation ; and, as previously indicated, several of our Massachusetts nurserymen are now putting on the market nothing but fumigated stock.

THE OUTCOME.

While the individual loss in many cases has been severe, the writer believes, with J. H. Hale of Connecticut, that the outcome of the occurrence of the San José scale in the east will be for the public good, and that the classes who have lost most heavily will ultimately reap the most benefit. The public has been aroused to the importance of insect damages. State legislation against injurious insects has been enacted. Facilities have been provided whereby the farmer may have to a greater degree than ever before the benefit of expert advice and assistance. Best of all is the awakening of interest in the care of trees. No longer is a fruit tree a machine or a callous organism, to be well treated or abused, as circumstances dictate. The farmer now watches his trees through critical eyes. He is learning of their life, their needs and their possibilities. He is learning the lesson that he should have learned before, — that in tree culture constant attention and thoroughness are the prime requisites of success, and that any other course will ultimately result in failure.

MASSACHUSETTS
CROP REPORT

FOR THE

MONTH OF JULY, 1898.

ISSUED BY

WM. R. SESSIONS,

SECRETARY STATE BOARD OF AGRICULTURE.

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CROP REPORT FOR THE MONTH OF JULY, 1898.

OFFICE OF STATE BOARD OF AGRICULTURE,
BOSTON, MASS., Aug. 1, 1898.

Bulletin No. 3, Crop Report for the month of July, is herewith presented. Special attention is called to the article on "Catch-crops," by Wm. P. Brooks, Ph.D., professor of agriculture at the Massachusetts Agricultural College, which is printed at the close of this bulletin. It is thought that this article will prove to be particularly timely to the season.

PROGRESS OF THE SEASON.

The July returns of the United States Department of Agriculture (Crop Circular for July, 1898) state that the preliminary returns on the acreage of corn indicate a reduction of 3 per cent from the area harvested last year. The average condition, 90.5, although 7.6 points higher than the condition at the corresponding date last year, is 1.7 points below the July average for the past twelve years and is one of the four lowest averages in that period.

The condition of winter wheat, 85.7, is 5.1 points lower than last month, but it is still 4.5 points higher than at the corresponding date last year and 4.3 points higher than the July average for the past ten years. The average condition of spring wheat is 95, which is 5.9 points lower than last month, but is 3.8 points higher than the corresponding date last year, is 6.2 above the average for the past ten years, and is the highest July average, with two exceptions, in thirteen years. The average condition of spring and winter wheat combined is 89.4, which is 4.5 points higher than at the corresponding date last year and 6 points higher than on July 1, 1896.

The average condition of oats, 92.8, is 5.2 points lower than last month, but it is 4.9 points higher than the July

average for the past ten years, and is, with one exception, the highest since 1889.

The average condition of barley is 85.7, which is 6.9 points higher than last month, but is 2.8 points lower than on July 1 last year and 3.1 below the July average for the past ten years.

The average condition of winter rye is 93.8, as against 95 at the corresponding date last year, 83.8 on July 1, 1896, and 90.6, the July average for the past ten years. The average condition of spring rye is 96.9, as against 90 on July 1, 1897, and 90.6, the July average for the last ten years.

There is an increase of 1.3 per cent in the acreage of Irish potatoes. The average condition of Irish potatoes, 95.5, is 7.7 points higher than at the corresponding date last year and 2.2 points above the ten-year average.

The acreage of sweet potatoes is about as last year, and the average of condition in the States of principal production is 91.2.

The average condition of cotton is 91.2, against 89 last month, 86 on July 1, 1897, and 92.5 on July 1, 1896.

The condition of tobacco in New York, Maryland, Virginia, Tennessee, Ohio, Wisconsin and Missouri exceeds the ten-year average, while the conditions for Connecticut, Massachusetts, Pennsylvania, North Carolina and Indiana are somewhat below it.

The reports as to forage crops are, with few exceptions, exceedingly favorable. The reports for timothy hay and clover are generally far above the ten-year average. Pastures are also generally in most excellent condition.

The outlook for the apple crop is very discouraging. Eleven of the fourteen principal apple-growing States report even a lower average condition than at the corresponding date last year.

With a few notable exceptions indications as to the peach crop are somewhat unfavorable.

In Massachusetts the acreage of corn compared with last year is 99 and the average condition July 1 is 90; the average condition of oats 94; the average condition of barley 99; the average condition of spring rye 98; the acre-

age of potatoes 109 and the average condition 94 ; the acreage of tobacco 111 and the average condition 90 ; the average condition of clover 110 ; the average condition of timothy 110 ; the average condition of pasturage 107 ; the average condition of apples 88 ; and the average condition of peaches 60.

TEMPERATURE AND RAINFALL FOR THE WHOLE COUNTRY.

Week ending June 27.—The week averaged slightly cooler than usual on the Atlantic coast from the Carolinas northward to southern New England, in the Ohio valley, over the greater part of the Lake region, and from Montana westward to the north Pacific coast. Elsewhere the week generally averaged warmer than usual, the excess in South Dakota and northern Kansas amounting to from 6° to 8° per day. The greater part of the country received less than the average amount of rain. More than the usual amount fell, however, in portions of the Missouri, Mississippi and Ohio valleys and over the most of the Lake region. Very little rain fell in New England, the middle Atlantic States, over the greater portion of the Gulf States and the Eastern Rocky Mountain slope. Upon the whole the general weather conditions of the week were favorable to agricultural interests.

Week ending July 4.—The week was cooler than usual in the east Gulf States, the southern portions of Oklahoma and New Mexico, and from the north Pacific coast eastward to Lake Superior. In the lower Missouri valley, and generally in all districts east of the Mississippi, the week was warmer than usual, the daily excess ranging from 3° to 8°. Very hot weather prevailed on July 2 and 3 in the Atlantic coast districts. There was more than the usual amount of rain over the greater part of the west Gulf States and New Mexico, and portions of the Northern Mississippi and Missouri valleys. In the States of the Middle Rocky Mountain slope, Missouri, central Mississippi and lower Ohio valleys, the lower Lake region, and generally throughout the Atlantic coast districts there was less than the usual amount of rain. The week, being hot and dry, was generally favorable to farm operations.

Week ending July 11.—The week was cooler than usual

from New England and the middle Atlantic States westward to the Mississippi valley, in the South Atlantic and east Gulf States, in the lower Missouri valley and over the southern Rocky Mountain slope. The week was warmer than usual generally throughout the Rocky Mountain region and in the upper Missouri valley. More than the usual amount of rain fell along the south Atlantic coast, at some immediate coast stations of the middle Atlantic States and southern New England, over portions of the east Gulf States, portions of the Missouri and central Mississippi valleys and local areas in Texas. The week was drier than usual generally throughout the Lake region, Ohio and upper Mississippi valleys, and over the greater part of New England, the middle Atlantic and central and west Gulf States. Rains were much needed at the close of the week in the Lake region, middle Atlantic States and New England.

Week ending July 18. — The week was warmer than usual in the central and southern plateau regions, and over the northern districts from Idaho eastward to the Lake regions. It was slightly cooler than usual over portions of the central and north Pacific coasts, throughout the southern portions of the country east of the Rocky Mountains, including the lower Missouri, central Mississippi and lower Ohio valleys, middle Atlantic States and New England. There was more than the usual amount of rain in the east Gulf States, portions of the Ohio valley, southern New England, and over local areas throughout the country. The week was drier than usual in northern New England, over the greater portion of the Lake region and middle Atlantic States, in Tennessee, and generally throughout the lower Ohio, upper Mississippi, Missouri and Red River valleys. Rain was generally needed in the Missouri, upper Mississippi and Ohio valleys, the Lake region and over New England.

Week ending July 25. — The week was warmer than usual in all districts east of the Rocky Mountains with the exception of the upper Missouri and Red River valleys and along the New England coast, where it was slightly cooler than usual. Generally through the central and eastern sections of the country the daily temperature excess amounted to from 3° to 9° per day. The week was cooler than usual over the

southern plateau region, the northern Rocky Mountain districts and throughout the Pacific coast States. The greater part of the country east of the Rocky Mountains received less than the usual amount of rain, the rainfall, however, being very irregularly distributed, there being numerous, though not extensive, areas where heavy rains occurred. There was a general absence of rain in the central and southern Rocky Mountain regions and in the Pacific coast districts.

SPECIAL TELEGRAPHIC REPORTS.

Week ending June 27.—New England. Boston: Weather favorable for farm operations; too cool in northern sections for rapid growth of crops, but very favorable in southern portions; rain is needed in Rhode Island and Connecticut, where pastures are drying up; tobacco backward, plants short on account of lack of warm, sunny weather.

Week ending July 4.—New England. Boston: Week of fair weather and abundant sunshine greatly improved all crops and was most favorable for all farm operations; rain needed in all sections; drought in parts of Rhode Island and Connecticut, drying pastures and injuring crops.

Week ending July 11.—New England. Boston: Fair, sunny weather, most favorable to haying, which progressed with great success in all sections; rain needed throughout district; streams low and pastures dry in southern sections; some damage to crops in Rhode Island and Connecticut; light frost in northern sections on the 6th did little damage.

Week ending July 19.—New England. Boston: Crops much improved in Rhode Island, Connecticut and eastern Massachusetts, though more rain is needed in localities; drought continues in northern States, where all crops are suffering; frosts on the 11th and 12th did considerable damage to vegetables and vines on lowlands in northern States; hay crop is one-half to three-fourths secured, large yield.

Week ending July 25.—New England. Boston: Showers and high temperatures greatly improved crops; Vermont, New Hampshire and western Massachusetts are still much in need of rain; large hay crop three-fourths secured; tobacco in fair condition and nearly ready to cut in some sections; cranberries promise an average crop; apples very light.

WEATHER FOR JULY, 1898.

July was a month of extremes in temperature, ranging from a maximum of about 98° on the 3d to a minimum of about 48° on the mornings of the 10th to 12th inclusive. In some places light frosts were reported on the 12th but no damage resulted. The precipitation was deficient during the first half of the month, but later numerous showers brought the amount up to the average. A very severe thunderstorm passed over east-central Massachusetts during the afternoon of the 21st. The rainfall was very heavy and considerable damage was done by lightning. This storm was most welcome as the ground at that time felt the lack of moisture and some crops were beginning to show the effects of the drought quite seriously. The last three days of the month were generally cloudy, with scattered light showers, and altogether more favorable than the hot, dry weather of the first decade. The winds during the month were of moderate velocity, and, as is usual at this season of the year, came from the south-west more frequently than from any other direction. At Boston the wind attained a velocity of thirty-five miles per hour on the 21st during the passage of the thunderstorm mentioned above.

In the circular to correspondents, returnable July 23, the following questions were asked:—

1. What insects are proving most troublesome in your locality?
2. What is the condition of Indian corn, and what proportion of the crop will be put into the silo?
3. What is the quantity and quality of the hay crop as compared with former years?
4. What forage crops are being raised to supplement the hay crop, for the silo, and to eke out the pastures, and what is their condition?
5. What is the condition of market-garden crops, including potatoes, and how have those already harvested compared in yield and price with former years?
6. What is the prospect for apples, pears, peaches, plums, quinces, grapes and cranberries?

7. What is the condition of pasturage in your locality?

8. How have rye, oats and barley compared with former years, both as grain and forage crops?

Returns were received from 176 correspondents, from which the following summary has been made : —

INSECTS.

The season continues to be remarkably free from the presence of insects in such numbers as to be particularly injurious. The potato beetle is the one most commonly spoken of as doing damage, but even this insect does not appear to be as destructive as usual. There are several reports from Hampden County that the elm tree leaf beetle is at work on the elms, and this insect would appear to be thoroughly established in that section. Other insects reported as doing damage are currant worms, tent caterpillars, squash bugs, cabbage worms, onion maggots, canker worms, rose bugs, cut worms, horn flies, squash vine borers, asparagus beetles, white grubs, strawberry fleas, grasshoppers, plant lice and cranberry vine and fire worms.

INDIAN CORN.

Indian corn has come forward very rapidly during the recent hot weather and is now generally in good condition. Some correspondents qualify their statements in regard to the crop by saying that it is late, but with good growing weather the prospect is that it will soon regain all lost ground. The proportion that will be put into the silo varies widely in different localities. The proportion is largest in Worcester County and smallest in the south-eastern section of the State, but we believe it to be everywhere steadily, if slowly, increasing.

THE HAY CROP.

The hay crop is everywhere reported as very good indeed, larger, if anything, than last year's exceptional yield. At the time of making returns haying was practically completed in all sections. The quality of the crop was excellent and the good hay weather of the early part of the month enabled the farmers to secure it in prime condition. Certainly as

large a crop of as good quality has not been secured in as good condition within recent years.

FORAGE CROPS.

The heavy hay crop and the good condition of pastures have both operated to reduce the acreage devoted to forage crops somewhat. They are generally in good condition. Fodder corn is the crop most extensively grown for forage, and oats, Hungarian grass, barley, millet, and peas and oats follow in the order given. Other crops grown for forage are vetches, oats and barley, peas and barley, cow peas, turnips, rye, soja beans, and oats and rye.

MARKET-GARDEN CROPS.

Market-garden crops are generally reported as in good condition and promising well. Prices average about as in other years, any falling off on some crops being balanced by increases on others.

EARLY POTATOES.

Early potatoes have not been generally dug as yet, but the returns seem to indicate that the crop, as a whole, will be light rather than otherwise, the hot dry weather of early July having operated to check their growth in most instances. No complaint of blight is noted as yet. Prices generally rule high, but reports have been made only on the very first digging, and cannot be taken as surely indicative of later results.

FRUITS.

Apples will be a light crop for a bearing year, not having set well and having also dropped badly. Pears will also be a light crop. Peaches are generally reported as most unpromising. Plums promise a fair crop and quinces a good crop. Grapes generally promise well though there is some complaint that they are not as forward as they should be. The returns do not warrant any very definite statement as to cranberries, but we should judge that the crop was, on the whole, hardly up to the average.

PASTURAGE.

Pastures suffered somewhat from the hot, dry weather, but are still generally in good condition. The recent rains have generally helped those that were getting short and with favorable weather all should do well in future.

SMALL GRAINS.

Rye, oats and barley appear to be about average crops, being certainly up to the average and perhaps slightly above. There is a little complaint of rust on oats, but not enough to materially affect the total crop.

NOTES OF CORRESPONDENTS.

(Returned to us July 23.)

BERKSHIRE COUNTY.

New Marlborough (L. P. KEYES).—Corn is about two weeks late, but is looking fairly well. The hay crop is above the average in quantity and quality. Fodder corn is largely grown to help out the pastures. The recent dry weather is seriously affecting the potato crop and the yield is very light. The prospect for all kinds of fruit is poor; apples set well but have fallen badly. Pastures have been unusually good, but the late dry weather is affecting them somewhat. Rye is above an average crop; oats looking fairly well, although some are rusting slightly.

Tyringham (GEO. F. KOPP).—Potato bugs are doing some damage. Corn is looking well, but is rather late; but little is used for the silo. Hay was a very good crop of extra quality. Fodder corn is the principal forage crop grown. Potatoes are looking finely and will be a good crop. No apples of any amount. Pastures have been rather dry but recent rains have helped them. Oats and rye promise well. Tobacco is looking finely and promises a good crop. Onions are doing well and promise a good crop.

Lee (A. BRADLEY).—Potato bugs are doing some damage. Indian corn is in first class condition; perhaps 8 per cent of the crop will go into the silo. Hay was more than a normal crop and the quality was very good. Fodder corn and cabbages are the principal crops grown to help out the hay crop and the pastures. Apples are 90 per cent of a full crop. Pasturage is in first class condition. Rye and oats are very good crops.

West Stockbridge (WM. C. SPAULDING).—Currant worms and potato bugs are doing a little damage. Indian corn is in fair condition, but has suffered somewhat from want of rain; no silos here. Quantity of hay large, quality good, price very low; plenty of old hay on hand. No forage crops are being raised as hay is so plenty. Potatoes are looking well; none harvested as yet. All fruits will be light crops. Pastures are in good condition, but are now in need of rain. Rye, oats and barley promise well.

Richmond (T. B. SALMON).—Potato bugs are doing some damage. Indian corn promises to be about an average crop; a very small proportion will go into the silo. Hay is a large crop with the quality above the average. Sowed corn and millet are the principal forage crops grown here. Market-garden crops are in good condition and prices have averaged higher than last year. Apples a very small crop, pears about average, no peaches, no plums, quinces average and grapes good. Pasturage is in good condition. Rye, oats and barley are average crops.

Dalton (W. B. BARTON).—Potato bugs are doing some damage. Indian corn is in fair condition and three-fourths of the crop will go into the silo. The hay crop was large and secured in good condition. Millet and peas and oats are the principal forage crops grown. Market-garden crops are in fair condition. Apples are half a crop, pears one-fourth and plums one-third. Pastures are in good condition though they are getting a little dry. Rye fair, oats good, no barley. There is a good sale for milk and fair prices are realized.

Cheshire (L. J. NORTHUP).—The horn fly is proving rather troublesome. Indian corn is rather backward; none will go into the silo. The hay crop is above the average in quantity, but the quality is not quite up. Forage crops are not much raised this season, but some fodder corn has been put in. Market-garden crops are usually fine and early potatoes are yielding fairly well. Apples are dropping badly, pears promise a fair crop, grapes will be quite abundant, peaches and plums quite plenty. Pastures were getting rather brown and dry but the late rains will start them. Oats are not up to former years and rye is not an extra crop.

Williamstown (S. A. HICKOX).—Indian corn is in good condition now, but has begun to feel the drought to some extent; ten per cent of the crop will go into the silo. Hay was a large crop, but that early cut was got with very little sun so that the quality is slightly off. Market-garden crops are feeling the drought, but potatoes are in fair condition. Apples are not much over half a crop. Pasturage is getting short. Rye, oats and barley promise well.

FRANKLIN COUNTY.

Charlemont (H. S. GILES).—Potato bugs are doing some damage. Corn is a good crop and is growing rapidly; three-fourths of it will go into the silo. The hay crop is the largest in many years and of good quality. Fodder corn is the principal forage crop and is in good condition. Potatoes look well and the price is higher than last year. The prospect for fruit crops is below the average. Pasturage is fairly good now, but if dry weather continues there will be short feed. Rye, oats and barley are about average crops.

Ashfield (CHAS. HOWES).—With the exception of potato bugs insects are not very troublesome. Corn is now making a rapid growth; probably three-fourths of the crop will go into the silo. Corn and oats are the principal forage crops. Garden crops are yielding well; but few potatoes have been dug but they are looking finely. Most fruits are looking fairly well. Pasturage never looked better at this season. Rye, oats and barley are mostly raised for forage.

Bernardston (R. H. CUSHMAN).—Potato bugs have been plenty. Corn is somewhat late, but is coming forward nicely since the late rains. Hay was a large crop and the quality was excellent on high land. Corn is the principal forage crop raised and three-fourths the entire crop is put into the silo. Early potatoes are turning out a good crop and late ones are looking well. Very light crop of apples; winter fruit barely enough for home use. Growth of rye, oats and barley not large, but grain looks favorably for a good crop.

Gill (F. F. STOUGHTON).—Tent caterpillars are doing some damage. Indian corn is late; one-sixth or less of the crop will go into the silo. The hay crop was larger than ever before and its quality was very good. Fodder corn is the principal forage crop raised. I think all fruits will be a light yield. Pastures are in extra good condition. Oats are in very good condition; rye and barley not raised.

Whately (FRANK DICKINSON).—There are few insects doing damage. Corn is growing well now, but is a little late; very little is used for the silo. Hay was a heavy crop of good quality. Fodder corn is the principal forage crop and is in good condition. Market-garden crops are in good condition; few potatoes are dug as yet, but they are looking well. About half a crop of apples and pears and no peaches. Pasturage is in fine condition. Rye and oats are good crops.

Sunderland (J. M. J. LEGATE).—Potato bugs are doing some damage. Corn is looking well and three-fourths of the crop will go into the silo. Hay was a very heavy crop and was secured in fine condition. Fodder corn is the principal forage crop grown with perhaps a few oats.

Market-garden crops are above the average in condition, but prices hardly hold up; potatoes look well, but are suffering from drought. All fruits will be short crops except plums and grapes which promise above the average. Pasturage continues in good condition.

Wendell (N. D. PLUMB).—Indian corn is above the normal in condition; about three-fourths of the crop will go into the silo. The quantity of the hay crop was the largest ever known and the quality of the best. Sowed corn is the only forage crop raised and promises a very large crop. Potatoes look very promising and prices rule high. Apples two-thirds of a crop; pears and peaches half crops. Pasturage is in good condition. Rye and oats are far above the average of former years.

Orange (ANSEL HARRINGTON).—Potato bugs are the only insects doing any particular damage. Corn is in good condition and nearly all of it will be put into the silo. Hay was 10 per cent above an average crop, of good quality and gotten in excellent condition. Fodder corn is the principal forage crop, with some oats, barley and millet and all are in good condition. Market-garden crops are in good condition, the yield and price being about as in former years. There will be about an average crop of nearly all kinds of fruit. Pastures are in very good condition, but are getting a little dry. Rye, oats and barley are full average crops.

HAMPSHIRE COUNTY.

Greenwich (WM. S. DOUGLAS).—Indian corn is in good condition and a very small part of it will go into the silo. The hay crop was large and of good quality. Market-garden crops are in good condition, but not quite as early as usual. The dry weather has affected all kinds of fruit. Pastures are badly dried up. Rye, oats and barley are average crops.

Enfield (D. O. CHICKERING).—Potato bugs are doing some damage. Corn is in good condition and a very small proportion will go into the silo. The hay crop is rather above the average. Fodder corn is the principal forage crop grown and is in good condition. There will be a light crop of fruit. The dry weather has injured the pastures. Rye, oats and barley promise well.

Belchertown (H. C. WEST).—Potato bugs are the worst insects, but none are particularly bad. Indian corn is looking fairly well; very little goes into the silo. Hay was a full average crop with the quality far above the average. Corn, oats, millet and barley are the forage crops grown and all are looking well. Market-garden crops are looking fairly well, but potatoes are calling for rain. It is an off year for fruit of all kinds, perhaps there will be one-third of a crop of apples and less of other fruits. Pasturage is in fair condition, but rain is needed. Rye, oats and barley are full average crops.

Amherst (WM. P. BROOKS).—Corn is in good condition though somewhat backward, and fully half the crop will go into the silo. Hay was the largest crop and harvested in the best condition ever known. Less than the normal amount of forage crops will be grown; the principal ones are oats and peas or vetches, millet and Hungarian grass. Potatoes promise finely; celery plants late and poor weather for setting. Apples promise fairly; pears, peaches and plums a fair crop; grapes a large crop. Pasturage is in fair condition, but is getting short. Rye is apparently unusually good, but oats have rusted badly.

Easthampton (WM. C. CLAPP).—Squash bugs, potato bugs and cabbage worms are doing some damage. Indian corn is somewhat backward; about the usual proportion will be put into the silo. The hay crop was larger in quantity than usual and of fair quality. Oats are the principal forage crop and are below the average in condition; a few pieces of millet are sown. Market-garden crops have needed rain badly and potatoes are backward. Apples are scarce and other fruits are

probably below the average. Pastures on uplands are drying up, but lowlands are looking better. Rye is a large yield, oats backward, but little barley raised. Tobacco is looking fairly well.

Westhampton (F. A. BRIDGMAN).—Potato bugs and tent caterpillars are doing some damage. Corn is in good condition and three-fourths of the crop will go into the silo. Hay was a large crop and of extremely good quality. Fodder corn and Hungarian grass are the principal forage crops. Apples, pears and grapes are fair crops. Pasturage is in very poor condition, but would have been good if the pastures had not been so brushy. Potatoes promise only a light crop.

Chesterfield (HORATIO BISBEE).—Potato bugs are doing some damage. Indian corn is in fairly good condition and but a small part goes into the silo. Hay was a very large crop of fine quality. But little is being done in the way of forage crops beside corn. The apple crop is not a large one this year in this locality. Pasturage is in good condition. Potatoes are not very promising, the tops being rather light. Rye, oats and barley promise well.

Goshen (ALVAN BARRUS).—Potato bugs are doing some damage. Corn is late and much of it will be used for fodder green or dry. The quantity and quality of the hay crop were never better. Fodder corn is about the only forage crop raised. Potatoes have not yet matured and but little is done at market gardening. The prospect was poor for all kinds of fruit from the start and a severe hailstorm has also done them much damage. Pasturage is in first class condition. Rye, oats and barley are about average crops.

HAMPDEN COUNTY.

Chester (P. M. ADZIMA).—Potato bugs are doing some damage. Indian corn promises about an average crop; about two-thirds of it will go into the silo. The hay crop is a third larger than usual and is of good quality. Sweet corn and Hungarian grass are the principal forage crops grown. Market-garden crops are in good condition; prospect good for potatoes though but few have been harvested as yet. The prospect is very good for all kinds of fruits. Pastures are in average condition. Rye, oats and barley are but little raised.

Tolland (E. M. MOORE).—Potato bugs have been somewhat troublesome. Corn has a good color and is looking well; only a small proportion of the crop will go into the silo. The hay crop is unusually large and of good quality. Millet is the principal forage crop and is looking fairly well. Early potatoes are yielding well and bring a larger price than usual. Apples are dropping badly and the prospect for all kinds of fruit is poor. Pastures are in pretty good condition though getting somewhat dry. Rye, oats and barley will be light crops.

Granville (JOSEPH WELCH).—Potato bugs are doing some damage. Corn is looking finely; no silos in this vicinity. The hay crop is the largest in years and of the finest quality. Fodder corn is the only forage crop raised and not much of that. The crop of fruit of all kinds will be light. Pasturage is in good condition. Rye, oats and barley are little raised for grain, but considerable barley and oats are cut and cured for winter use.

West Springfield (T. A. ROGERS).—Potato bugs and onion maggots are doing some damage. Indian corn is looking well; only a small proportion will go into the silo. The hay crop was never larger or of better quality. Fodder corn and oats and peas are the principal forage crops grown. Nearly all market-garden crops have done well, except potatoes, which were injured by the hot, dry weather. Apples dropping badly; pears, plums, quinces and grapes looking fairly well; no peaches or cranberries to speak of. Pastures are short and dry at present;

cause, three weeks fine hay weather. Rye good; oats have rusted and are small.

Chicopee (R. W. BEMIS).—Potato bugs, elm tree leaf beetles and canker worms are doing some damage. Indian corn is looking well; new silos are being built every year. The hay crop is large this year and good as all large crops are as to quality. Fodder corn, oats and barley are the principal forage crops grown and all are looking well. Market-garden crops are in good condition; but few early potatoes harvested as yet. Apples, pears, peaches, plums, quinces and grapes are all short crops. Pasturage is in good condition. Rye, oats and barley are average crops.

Ludlow (G. B. BENNETT).—Potato bugs have been very troublesome. Corn is in very good condition but backward; about one-tenth of the crop will go into the silo. Oats and peas, fodder corn and barley are the principal forage crops grown. Potatoes will be a light crop on dry land. Apples one-fourth a crop, pears and peaches a failure, plums fair, grapes very good. Pasturage is in excellent condition. Rye is above the average and oats about average. Haying is nearly done and a large crop has been secured in first class condition.

Longmeadow (W. F. EMERSON).—Potato bugs and elm tree leaf beetles are doing some damage. Corn is in good condition though perhaps a little later than usual; very little goes into the silo here. The hay crop was above the average in quantity and of very good quality. Potatoes somehow do not grow; some digging now; price \$1 per bushel. Apples and pears will be light crops. Pastures are well grown up to grass. Rye is a good crop, oats small.

Holland (FRANCIS WIGHT).—Potato bugs and squash bugs are doing some damage. Indian corn is rather late but is growing finely; no silos in this town. The hay crop was larger and of better quality than usual. Fodder corn is the only forage crop grown and that is in good condition. No early potatoes have been dug as yet. Apples will be rather a light crop, pears better, no peaches to speak of, plums fair, grapes good. The dry weather hurt pasturage some but it is doing better now. Rye, oats and barley are about average crops.

WORCESTER COUNTY.

Warren (W. E. PATRICK).—Indian corn is in fine condition; too small a proportion is put in the silo to make an estimate. The hay crop is the largest for several years and of very fine quality. Fodder corn, Hungarian grass and millet are the forage crops raised; less quantity raised than usual, but in extra condition. Yield of early potatoes will be light and the price high. There is the prospect of a good apple crop and of a medium crop of pears. Pasturage is in good condition as to growth, but is not fresh enough to make milk. Rye is the best crop for years; oats poor.

West Brookfield (L. H. CHAMBERLAIN).—No insects doing damage except potato bugs and they are not bad. Corn is 100 in condition; one-fourth of the crop will be put into the silo. The hay crop is better than for many years. Oats and Hungarian grass are the principal forage crops. Market-garden crops are in good condition; but few potatoes harvested. Apples 100, pears 50, no peaches, plums 25, quinces 75, grapes 85 and no cranberries. Pasturage is in first class condition. Rye 100 and oats 75.

New Braintree (C. D. SAGE).—Potato bugs are doing some damage. Corn is looking well, but is a little late; perhaps 10 per cent of the crop will be put into the silo. A large hay crop is being secured in fine condition. Less forage crops than usual are being raised and oats and barley are the principle ones. Potatoes are looking well. Apples will be a small crop, some pears, grapes rather light, very few peaches and

plums. Water is very low in pastures; feed plenty but much of it is coarse. Rye is a fair crop and oats and barley are good.

Petersham (S. B. COOK).—Potato bugs and rose bugs are doing some damage. Indian corn is growing finely and a large crop is promised; one-fourth of it is for the silo. The hay crop is larger than for many years and the quality is good. Fodder corn is the principal forage crop grown with some roots and barley. Market-garden crops are doing well, although the late dry weather affects potatoes somewhat. The prospect for apples, pears and grapes is good. Pasturage is in good condition for the time of year. Rye, oats and barley are rather above average crops.

Winchendon (W. H. SAWYER).—Tent caterpillars are doing some damage. Indian corn is backward but is growing fast at present; two-thirds of the crop will be put into the silo. The hay crop is the best for years. Oats and peas, fodder corn and barley are the principal forage crops grown. Market-garden crops are late but are coming forward fast. All fruits promise about half a crop. Pastures are in fair condition for the time of year. Rye, oats and barley are average crops.

Gardner (A. F. JOHNSON).—Potato bugs and other pests are about as prevalent as usual. Corn looks well with a good thrifty growth but is late; all of it will be put into the silo. Hay was a heavy crop of fine quality and cured in good shape. Barley and Hungarian grass are the principal forage crops. Potatoes are late and none are dug as yet but they are looking well; other market-garden crops look well with average yields and average prices. There will be a fair crop of apples, but they do not appear to be smooth. Pastures are in good condition.

Ashburnham (ALBERT NEEDHAM).—Potato bugs and cabbage worms are doing some damage. Corn is late, but is looking thrifty; about one-third of the crop will go into the silo. The hay crop is large and of fine quality and that cut the last of June and the first of July was secured in good condition. Peas and oats and barley are the principal forage crops. Potatoes are looking finely though but few have been dug as yet. The prospect is for a fair crop of apples, small fruits not much raised. Pastures are looking well. Rye, oats and barley are about normal crops.

Princeton (A. O. TYLER).—No insects are doing damage. Indian corn is in good condition and nearly all of it is put into the silo. The hay crop was very large and of good quality. Oats and fodder corn are the forage crops raised and are in good condition. Market-garden crops are in good condition and potatoes are looking well. Apples promise a moderate crop, pears a small crop; peaches, plums, quinces and grapes not very heavy crops. Pastures have been in good condition but are dry now. Rye, oats and barley are about average crops.

Bolton (H. F. HAYNES).—There is very little trouble from any insect. Indian corn is looking well and about one-fourth of the crop will go into the silo. Hay was a large crop of good quality. Fodder corn is the principal forage crop raised. Potatoes were injured 25 per cent or more by the dry weather. Apples 75, pears 50, peaches few, other fruits about average. Pasturage is in fine condition. Rye, oats and barley are all cut for hay and are good crops.

Millbury (C. H. STOCKWELL).—Potato bugs and cabbage worms are doing some damage. Corn is looking well; half the crop will go into the silo and several new silos will be built this fall. A very large crop of hay of very good quality is being harvested. Barley, millet and fodder corn are the principal forage crops raised and are all looking well. Market-garden crops are all in good condition. There will be about half a crop of all kinds of fruit. Pastures are in fair condition although they have dried up somewhat. Rye, oats and barley are very good crops both as grain and for fodder.

Oxford (D. M. HOWE).—Corn is growing very fast now and looks

very promising; probably three-fourths of the crop will be put into the silo. The hay crop is a third larger than usual and the quality was never better. Forage crops are in excellent condition. Market-garden crops are backward; price of potatoes \$1.25 per bushel. Apples fair, few pears, few peaches, no plums, few quinces, grapes plenty. Pastures were never in better condition. Rye, oats and barley promise average crops.

Hopedale (DELANO PATRICK).—There are a few canker worms and potato bugs doing damage. Corn is looking well now; probably two-thirds or more of the crop will be used for the silo and for forage. The hay crop was larger than usual and mostly well secured, but the quality will probably be a little off. Fodder corn is the principal forage crop raised and it is promising. Market-garden crops are doing well, with a good yield and rather lower prices than usual. Apples about half the usual crop for the bearing year; pears, peaches and plums light; grapes a fair crop. Pasturage is in fair condition.

Mendon (J. N. NUTTER).—Potato bugs and squash bugs are doing some damage. Corn is looking finely but is a little backward; a small proportion of it will go into the silo. Hay is a superior crop both as regards quantity and quality. Oats and corn are the principal forage crops grown. Market-garden crops yielded very well and the prices are very high. Apples a fair crop; peaches, plums and pears scarce; grapes and cranberries looking well. Pasturage is in very good condition. Rye and oats are about average crops.

MIDDLESEX COUNTY.

Sherborn (N. B. DOUGLAS).—Potato bugs are doing some damage. Indian corn is looking well; little if any will be put in the silo. The hay crop was 25 per cent above the average in quantity and of A No. 1 quality. Oats, barley and Hungarian grass are the forage crops grown and all are looking well. Potatoes look well, but not enough have been dug to judge of yield, prices high. Apples and grapes fair crops, other fruits light. Pasturage was never in better condition. Rye, oats and barley not raised except for forage.

Framingham (H. S. WHITTEMORE).—Potato bugs and cut worms are doing some damage. Indian corn is in better condition than usual and about half the crop will go into the silo. The quantity of the hay crop was larger than for many years and the quality was good. Fodder corn, Hungarian grass and oats are the principal forage crops raised and are in good condition. Market-garden crops are good with average yields and prices so far. Apples a short crop, pears light, no peaches, few plums, few quinces, but good prospect for grapes and cranberries. Pasturage was never in better condition. Rye, oats and barley are about average crops.

Concord (WM. H. HUNT).—Potato bugs and currant worms are as abundant as usual. Corn was late from cold, wet weather but is now growing finely; only a small proportion is put into the silo. The quantity and quality of the hay crop were both above the average. Apples a moderate crop, pears very few, peaches moderate, plums very few and quinces average. The condition of pasturage is good on account of the abundant rains. Rye, oats and barley are average crops.

Littleton (G. W. SANDERSON).—Potato bugs are doing some damage. Indian corn is in good condition; probably one-third the crop will be put into the silo. Quantity of hay crop large, quality excellent. Barley, Hungarian grass and millet are the principal forage crops raised. Market-garden crops are in good condition; potatoes are looking excellently but very few have been harvested. Apples have fallen considerably, but the balance on the trees are good; but few peaches; grapes good. Pasturage is in excellent condition. Oats and barley are raised and cured for fodder in considerable quantities and are looking well.

Townsend (G. A. WILDER). — Potato bugs are doing some damage. Indian corn is in very good condition and three-fourths or more of the crop will go into the silo. There is a heavy crop of hay and the quality was never better. Fodder corn is the principal forage crop grown. Market-garden crops are not up to the average in condition. The prospect is for a fair average crop of all kinds of fruit. Pasturage is in good condition. Rye, oats and barley are about average crops.

Tewksbury (G. E. CROSBY). — Potato bugs are doing some damage. Very little Indian corn is grown here, but it is in good condition. The hay crop is the largest for several years and is seemingly of good quality. Hungarian grass and oats are the principal forage crops grown. Market-garden crops are in good condition and prices compare well with last year. Apples and grapes full average crops; other fruits scarce. Pastures are in fine condition. Rye, oats and barley are good crops.

Burlington (C. E. MARION). — Potato bugs are doing some damage. The hay crop is one-third larger this year than for the last two years. Some barley and oats have been sown but not in large quantities, condition good. The potato crop is looking well, but none have been sent to market. All market-garden crops are doing well. Pole beans are blighted. The squash crops are looking very fine and promising large crops. Onions are looking finely. Cabbages and cauliflowers are being set out in large quantities. Apples are a light crop; pears are a fair crop; no peaches or plums; grapes and cranberries light. Pastures are in good condition. Rye, oats and barley are about average crops.

Winchester (MARSHALL SYMMES). — Very few troublesome insects in sight. The hay crop is nearly as heavy as last year and is of extra good quality. All market-garden crops are now doing finely; beans and peas sell at a much better price than last year. Apples and pears did not set well and the crop will be light; peaches and plums will be very scarce in this section. Recent rains have brightened up all pastures. Rye is a good crop and is nearly all cut.

Weston (H. L. BROWN). — At the present time there are no very troublesome insects. There is an unusually large crop of hay and the quality is good. Those who have silos are raising corn to fill them; otherwise little is done with forage crops. Potatoes are looking well on some fields and poorly on others. Sweet corn is looking well; cabbage crop poor but selling very well as are all market-garden crops. Apples a small crop, few pears, no peaches; plums, quinces and grapes little raised and small crops promised. Pastures are short and dry, but the recent rains have given them a start.

Newton (OTIS PETTEE). — Potato bugs and currant worms are doing some damage. Indian corn is in very good condition and promises a large crop; rather less will be put into the silo than usual. The hay crop is heavy and of good quality. Fodder corn is the principal forage crop grown although considerable oats are being used. Potatoes promise well and are of good quality. Pasturage is in very good condition. Rye, oats and barley promise very fairly.

ESSEX COUNTY.

Salisbury (WESLEY PETTENGILL). — Potato bugs are doing some damage. Since the hot weather commenced corn has improved rapidly and is now looking well; only a small part goes into the silo. Hay was the largest crop ever known and cured in prime condition. Fodder corn is the principal forage crop grown. Market-garden crops are looking well, yield good, prices fair; potatoes high, \$1.25 per bushel. Apples are looking poorly, pears light, peaches very few, plums light, grapes good. Pastures are in fair condition. Rye, oats and barley are full average crops.

Haverhill (EBEN WEBSTER). — There is not much trouble from

insects. Corn is a little backward, but of good color; about half the crop goes into the silo. The hay crop was larger than usual and of good quality. Fodder corn, Hungarian grass and some oats and barley are the principal forage crops raised. Market-garden crops are about as usual in both condition and price. Prospect for apples poor, pears poor, no peaches and grapes good. Pasturage is in good condition. There are some good fields of rye.

West Newbury (J. C. TARLETON).—Potato bugs are doing some damage. Indian corn is backward; about half of it will go into the silo. The hay crop is extra good both in quantity and quality. Barley, corn and Hungarian grass are the principal forage crops grown. The prospect is not very good for any kind of fruit. Pasturage is in good condition.

Newbury (GEO. W. ADAMS).—White grubs are doing some damage. Indian corn is in good condition and about one-tenth of the crop will go into the silo. Hay was 10 per cent above a full crop and the quality was good. Fodder corn is the principal forage crop grown and is in good condition. Market-garden crops are in good condition. Pears and grapes promise well; other fruits will be poor. Pasturage is in excellent condition. Rye, oats and barley are above the average.

Ipswich (O. C. SMITH).—There are but few insects doing damage. Corn looks well and is growing fast; no increase in the amount put into the silo. Hay was above an average crop in quantity and mostly of the best quality. Fodder corn is the principal forage crop raised and it is mostly in good condition. All vegetables are growing finely; potatoes never better; prices low. Apples and pears will be small crops; quinces, grapes and cranberries promise well. Pastures were drying up the first of the month but are now in good shape. Rye is a very good crop and oats and barley promise well.

Danvers (C. H. PRESTON).—Indian corn is in good condition and four-fifths of it will be put into the silo. The hay crop was very large but some of it was not secured in good condition. Oats and peas, fodder corn and Hungarian grass are the principal forage crops and all promise well. Most market-garden crops have done well and potatoes promise well. There are no apples and pears will be a small crop. Pasturage is in good condition. Currants have been nearly a failure in many places owing to a rust which caused the leaves to drop very early.

NORFOLK COUNTY.

Randolph (R. A. THAYER).—There are no insects of any account at present. Indian corn is very promising and is raised mostly for the silo. The hay crop is larger than for several years and is of good quality. Fodder corn, oats and millet are the forage crops grown and all are looking well. All market-garden crops look well with average yields and good prices. Apples will be half a crop, pears average and grapes promise a fair crop. Pastures are in good average condition for the season. Rye, oats and barley are mostly raised for fodder and are good average crops.

Sharon (H. L. NARAMORE).—The season is unusually free from insects. Indian corn is in very good condition and very little of it will go into the silo. The hay crop is the best in both quantity and quality it has been for many years. Fodder corn and a few oats are the forage crops raised and are in good condition. Market-garden crops are in good condition; price of potatoes high, quality good. Apples average, pears few, almost no peaches, few plums, quinces fair. Pastures are in good condition.

Millis (E. F. RICHARDSON).—Potato bugs, striped squash bugs and canker worms are doing some damage. Indian corn is in good condition and but very little will go into the silo. Hay was an extra crop of good

quality. Oats and peas, barley, Hungarian grass and fodder corn are the principal forage crops raised. Market-garden crops are in good condition and prices are fair. Pasturage is in good condition. Rye, oats and barley are fair crops.

Medway (MONROE MORSE).—Potato bugs are doing some damage. Indian corn is at present about 80 per cent of a full growth. Hay was 10 per cent above a full crop and of good quality. Fodder corn, oats and peas are the forage crops grown, but less were put in than usual. Potatoes look well at present. Apples half a crop, pears three-fourths, peaches one-fourth, plums half a crop and grapes a good crop. Pasturage is in unusually fine condition. Rye, oats and barley are good average crops both for grain and fodder.

Franklin (C. M. ALLEN).—Potato bugs and coddling moths are proving troublesome. Indian corn is 80 per cent of a full crop; not more than 15 per cent of it will go into the silo. There was a very heavy crop of No. 1 hay. Oats, barley, millet and fodder corn are the principal forage crops grown and are in average condition. Market-garden crops are about average in condition and potatoes look finely. There will be half a crop of all kinds of fruit. Pastures are in good condition. Rye, oats and barley are average crops.

Wrentham (THOMAS BREEN).—Potato bugs are doing some damage. Indian corn is in good condition. The hay crop is of good quality and larger than last year. Fodder corn is the principal forage crop raised. Market-garden crops are in good condition. Apples good, pears and peaches very short crops. Pasturage is in very good condition. Rye, oats and barley are very large crops.

BRISTOL COUNTY.

Mansfield (WM. C. WINTER).—Very little trouble from insects. Corn is looking well but is late; very little done with silos in this vicinity. The hay crop is extra in both quantity and quality. Sweet corn, Hungarian grass, oats and rye are the forage crops grown and all are in good condition. Market-garden crops are generally up to the average in yield, prices lower than usual; potatoes looking finely but late. Apples have dropped badly and will be but a medium crop, no peaches, very few plums, quinces fair, grapes are so late that it is doubtful whether they will ripen. Pastures were poor but abundant rains have started them up. Rye, oats and barley are above average crops.

Raynham (N. W. SHAW).—Rose bugs are doing some damage. Indian corn is in good condition; none is used for the silo. Hay was a very large crop and was secured in good condition. No forage crops are raised except corn for fodder. Market-garden crops are yielding fairly well; prices of potatoes higher than usual. Few apples and pears; not many peaches; a fair crop of plums; rose bugs destroying grapes. Pasturage is in very good condition. Rye, oats and barley are good crops.

Berkley (R. H. BARBITT).—The large white grub is the most troublesome insect at present. Corn is looking well; very little will be put into the silo. Hay was good in quality and above the average in quantity. Corn fodder, barley and Hungarian grass are the forage crops raised and are in good condition. There is not much money in market-garden crops this year. There is a small yield of potatoes. Apples a light crop; few pears and peaches; no plums; grapes and cranberries about average crops. Pasturage is in good condition. Rye, oats and barley are about average crops.

Dighton (J. N. PAUL).—Cabbage maggots and strawberry fleas are doing some damage. Indian corn is in good condition and very little of it will go into the silo. Quantity of hay larger than usual and quality very good. Barley, fodder corn and Hungarian grass are the principal

forage crops grown. Market-garden crops and potatoes are not up to former years, but prices are good. Apples poor, pears good, peaches poor. Pastures are in good condition. Rye, oats and barley are about average crops. Dighton had the largest strawberry crop ever grown and the quality was good, but prices were so low that they hardly paid for picking and thousands of quarts were not picked.

Dartmouth (L. T. DAVIS). — Potato bugs are doing some damage. Indian corn is looking very well; perhaps two-thirds of it will go into the silo. The hay crop was very good both in quantity and quality. Corn, oats and peas and barley are the principal forage crops grown and they are looking very well. Market-garden crops are not as good as some years and potatoes are hardly up to the average. Apples are one-fourth of a crop, pears three-fourths, plums one-tenth, grapes not quite half a crop. Pastures are in fair condition. Rye, oats and barley are hardly up to the average.

PLYMOUTH COUNTY.

Brockton (DAVIS COPELAND). — Horn flies and mosquitos are proving rather troublesome. Indian corn is in good condition and half the crop will go into the silo. The hay crop was first-class both as regards quantity and quality. Fodder corn is the principal forage crop grown. Market-garden crops are in fair condition, though the hot weather hurt the pea crop; prices on early crops less than usual. The hot, dry weather has caused apples to drop. Pastures are getting short.

Hanover (H. L. HOUSE). — Potato bugs are doing a little damage. Corn is in good condition; no silos in this vicinity. Quantity of the hay crop above the average and quality good. Some fodder corn and Hungarian grass are grown for forage and are generally in good condition. Some damage has been done to market-garden crops by dry weather; yield rather below average and prices low. The prospect is very good for all kinds of fruit. Pastures are in very fair condition, but the dry weather has hurt some on high land.

Duxbury (A. M. GOULDING). — We are remarkably free from insects of all kinds. Corn is coming forward rapidly and perhaps half the acreage will go into the silo. The hay crop is wonderful both as to quantity and quality. Early potatoes are a light crop with prices above the average. Market-garden crops were retarded by the wet weather in the early season and have not recovered; think they are one-third off from last year. Very few apples, peaches or plums; pears fair; quinces, grapes and cranberries promise well. Pastures are in very good condition. Rye, oats and barley are about average crops.

Bridgewater (ROWLAND CASS). — Potato bugs, cabbage worms and squash bugs are doing some damage. Corn is in good condition; none is used for silage. Hay was a very heavy crop of excellent quality. Fodder corn is the principal forage crop and is in good condition; oats and millet are grown in small quantities. Market-garden crops are generally good, potatoes look well, prices higher than usual. Apples about half a crop, pears poor, quinces good. Pasturage is in good condition. Rye, both straw and grain, is a heavy crop.

Carver (J. A. VAUGHAN). — The hay crop was large in quantity and good in quality. Fodder corn is the principal forage crop grown. Market-garden crops are in good condition. There will be but few apples and little other fruit. Pastures are getting dry. There was a full bloom of cranberries, but the extreme hot sun early in July, which seemed to burn and wither patches on many bogs, and later the fire worms and span worms, have damaged the crop to a considerable extent.

Mattapoisett (A. R. SWIFT). — Potato bugs are doing some damage. Indian corn is in good condition; no silos in this section. The hay crop is large and of good quality. Fodder corn is the principal forage crop grown. Market-garden crops are up to or a little above the average in

yield and price. The prospect for fruit is poor, but that for cranberries is good. Pasturage is in very good condition. Rye good, oats poor, not much barley raised.

BARNSTABLE COUNTY.

Falmouth (D. R. WICKS). — Potato bugs and squash bugs are doing some damage. Corn is growing fast; there are one or two silos in town. The hay crop was larger than usual and was got in in the best of order. Oats and corn are the principal forage crops. Most garden crops have been late, peas have not yielded well, other things fair; potatoes looking well. All kinds of fruit a failure except cranberries, which are looking well on some bogs. Pastures have been dry but are looking better since the recent rains. Oats are a short crop with some rust.

Mashpee (W. F. HAMMOND). — Potato bugs and fire worms are doing some damage. Indian corn is looking well. The hay crop was above the average and of good quality. Corn and oats are planted to help out the pastures. Market-garden crops are looking well, yield and price about average. Apples, pears, peaches, plums and quinces are a failure; grapes and cranberries half crops. Pasturage is very good. Rye and oats are less than average crops.

Barnstable (JOHN BURSLEY). — White grubs are eating grass roots and potatoes, and flies are annoying stock. Indian corn is in fair to good condition; none for silage. Hay is 50 per cent above the average in quantity and of good quality. Fodder corn is the only forage crop grown. Market-garden crops are in fair to good condition and prices are average. Apples, pears, peaches and plums very small crops; quinces and grapes good; cranberries average. Pasturage is in good condition. Rye good, oats very light, some lots nearly a failure.

Brewster (J. H. CLARK). — Cranberry insects are doing some damage. Indian corn is in very good condition; very little goes into the silo. Hay was better than an average crop. Market-garden crops are in very good condition and potatoes are fully up to the average. All fruits are very poor, except cranberries, which look well. Pasturage is in very good condition. Rye, oats and barley are fully up to the average.

Chatham (E. Z. RYDER). — There are no insects doing much damage. Indian corn is in very good condition; very little is put into the silo. The hay crop is good in quality and large in quantity. The condition of market-garden crops is good and they are about as in former years in yield and price. The prospect for apples and pears are good and cranberries are looking well. Pastures are looking very well with the prospect of good fall pasturage. Rye, oats and barley are looking well.

Wellfleet (EVERETT JACOBS). — Potato bugs are doing some damage. No Indian corn is raised of any account. The hay crop is above the average. Roots are mostly used to help out the hay crop and the pastures. Potatoes are rather poor on account of dry weather. Apples are very scarce and will be a failure this season; quinces and other small fruits good. Pastures are in rather poor condition although the late rains will improve them.

DUKES COUNTY.

West Tisbury (GEO. HUNT LUCE). — Potato bugs are doing some damage. Indian corn is looking finely; silos are not used here. The hay crop was above the average in quantity and of better quality than usual. Potatoes are rather small but recent rains will improve them; price high. The prospect is poor for all kinds of fruits. Pastures are in very good condition. Oats are about half a crop.

BULLETIN OF MASSACHUSETTS BOARD OF AGRICULTURE.

CATCH-CROPS.

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By the term catch-crop is commonly understood a crop which is used to fill a gap, whether caused by the failure of one of the regular crops of the farm or one coming between the main crops. It is a crop which occupies a field which, in the more common farm practice, would remain bare or unproductive. It is often an emergency crop, *i. e.*, a crop not at first planned for, but introduced to supply a want which is a consequence of accident or unforeseen conditions. A rigid regard for the teachings of farm economy would make catch-crops, save those sometimes introduced under the spur of unforeseen contingencies, as regular members of our rotations as any of the crops of the farm. It is not truer that "nature abhors a vacuum" than that the good farmer abhors bare fields. As idle hands find mischief, so also in one sense do idle fields.

IDLE FIELDS MAKE THEIR OWNERS POOR.

The idle field is no more at a stand-still than the idle hand. A growth of weeds on all except the most barren soon covers its nakedness. The increased labor in the care of crops in subsequent years, resulting from the germination of the countless seeds developed in the idle field, will make heavy inroads upon the owner's time or money. The catch-crop may be made to keep down these weeds; and right here is found one of the chief advantages of catch-cropping.

But the weeds upon the idle field may be kept down by occasional ploughing and harrowing, or they may be cut before they ripen seeds, may be argued. True, the weed-seed pest may be prevented in either of these ways; but even so the idle field makes the owner poor. Should he choose to keep the weeds down by occasionally working the soil, he gives his idle field what is known as a bare fallow; and it must be admitted that bare fallows were once recommended by the best farmers of their time. They are not advised by the progressive farmers of today; for it is known, largely as a result of the work of Lawes and Gilbert, that the increased productiveness which often follows a bare fallow is obtained at too heavy a cost. The items are: first, the loss of time; second, the labor of keeping the land clean; and third, the sacrifice to old ocean, to which it is carried by the leaching rainwater,

of a considerable share of the elements of fertility which nature renders soluble in the idle field. This sacrifice can be avoided if the soil be kept occupied with the hungry rootlets of a growing crop, for they will arrest the soluble elements in their downward course, and in the growing plant they will be converted into compounds of use and value.

He who chooses to leave his field idle, but prevents production of weed seeds by cutting, does far better than he whose field is the victim of pure neglect; but yet his labor is not directly productive. Even he is made poor. The rule of every good farmer should be "keep the land covered with a growing crop at all times when season permits." As soon as one crop is removed another should follow.

THE SELECTION OF CATCH-CROPS.

The catch-crop, in so far as may be possible, should combine the following characteristics: cheap seed, ability to thrive when sown broadcast, rapid growth, freedom from qualities, either of root or seed, which will cause it to become a troublesome weed, a deep vigorous root system, the ability to take a part of its nitrogen from the air, hardiness in winter (in the case of some), ability to stand frosts and to grow at a low temperature, and *value*, either as a fodder or for soil improvement.

The importance of these characteristics is in most cases perhaps evident; but concerning some of these points a few words in explanation seem desirable.

The *ability to thrive when sown broadcast* is highly important, since this is the quickest method of planting, and in most cases the farmer has not much time that he is prepared to devote to the production of a catch-crop. By this system, further, the weeds are more certainly and effectually stifled than in the drill system. The farmer will not, as a rule, wish to *cultivate* a catch-crop.

The catch-crop must be one that will *grow rapidly*; because, coming between or after main crops, the time available is short. Further, the rapid grower stifles and keeps down weeds while the slow grower, without culture, is itself stifled.

Some plants having most of the qualities above enumerated are yet unfit for catch-crops because they have vigorous root stocks; others it would be unwise to select because of the abundance of seed which would lie uninjured in the ground over winter or for many years.

A *deep and vigorous root system* enables the crop to gather abundance of food even from soils not very fertile. It makes a crop a good *rustler*, to use the expressive western term; and it is the rustler which thrives without special attention to manuring and culture. These the farmer will not care to give to catch-crops in the majority of instances; hence the importance of this characteristic.

Often an important object in the introduction of catch-crops is the improvement of the soil. *Those crops which can assimilate atmospheric nitrogen* serve this purpose most effectually. Other crops return to the soil only that nitrogen which they first take from it; and the soil cannot be enriched in this element by their growth. True, the culture of almost

any crop may be made to some extent a means of soil improvement; but only by the culture of plants belonging to the clover family can the store of nitrogen in the soil be increased.

The catch-crop is in many cases highly useful as a cover in winter, to protect the soil from loss of fine particles by wind or from washing. For this purpose we must have crops hardy in winter. It is, of course, self-evident that other crops besides winter annuals often have a value as catch-crops.

Ability to stand frosts is in a very great many cases a highly important characteristic of the catch-crop. It is often sown after the main crop. The time before the probable coming of frosts is short. Only a crop which will continue its growth in spite of frosts will prove of much value. Further, it is in late fall that the soluble nitrogen compounds are liable to be washed out of the soil by heavy rains unless the soil is filled with the feeding rootlets of growing plants. Only crops which resist frost can prevent this loss.

The catch-crop is grown sometimes chiefly because of its value as a money crop. This, however, in ordinary farming will seldom be the case. It is much more often grown as a means of augmenting the supply of food for the stock of the farm. In other cases, though less frequently, soil improvement by green manuring is the principal object in view in its culture.

It is possible by judicious selection of crops to realize both of the last-named objects at the same time to a very considerable extent. Sound New England dogma has it, "You can't eat your cake and have it too." In the matter of nitrogen this old saying is disproved. You may grow a crop of clover or clover-like plants; you (or your cow if you prefer) may eat this crop, and by so doing consume an enormous quantity of nitrogen; and yet in the soil upon which the crop was grown will be found more nitrogen than was contained in that soil at the outset. Is not this "eating one's cake and having it too"? It is those crops which enable us to do this which are among the most valuable as catch-crops.

Of the importance and value of money or of fodder crops it is unnecessary to write; but concerning the possible benefits of green-manuring a few words may be useful.

POSSIBLE BENEFITS OF GREEN-MANURING.

Among the possible and probable effects of green-manuring its relation to the supply of plant food in soil is one of the most important. Of the important elements derived from the soil which contribute to the nourishment of plants nitrogen is the only one the amount of which can be increased by green-manuring. This may be increased by the cultivation under suitable conditions of legumes (plants belonging to the clover, pea and bean family). These plants, as has been so many times pointed out in recent years, have the capacity to take nitrogen from the atmosphere; and if these plants be ploughed in or allowed to decay upon the soil, the nitrogen which they have taken from the air becomes available to plants belonging to other families which themselves have not the power to draw upon the air for this element.

It is important to point out, however, that legumes take nitrogen from the air in considerable quantities only when the proper conditions exist. What these conditions are should be made clear. The most important among them are the following: thorough drainage and aeration of the soil, a liberal supply of the mineral elements of plant food, particularly lime, potash and phosphoric acid, and a comparatively small amount of available nitrogen compounds in the soil. It is also essential that the bacteria upon which the assimilation of atmospheric nitrogen depends should be present in sufficient numbers.

Good drainage and aeration are essential because these bacteria will not flourish in soils imperfectly drained or aerated. An abundant supply of mineral elements of plant food is essential because without it the plants of the clover family are unable to make a large growth. With an abundant supply of these elements they can make a luxuriant development, because the supply of nitrogen in the air is inexhaustible.

The bacteria upon which the assimilation of atmospheric nitrogen depends are plants, of microscopic dimensions it is true, but just as really plants as the corn and potatoes of our fields. Being plants they must come from seed, or, what amounts to the same thing, from parts which serve the same purpose as seed. We should not expect a crop of corn or potatoes except the seed be planted, so we cannot expect the development of these bacteria without seed. Fortunately these bacteria, as is the case with many weeds, propagate themselves and are self-seeding. When once established in a field the farmer needs not to supply further seed of witch grass or "pusley." These plants will take care of themselves; so with the bacteria which are connected with the assimilation of atmospheric nitrogen, but there must be a stock of seed to begin with. The beginning was made long ago in the case of all the common plants of the clover family, and the seed of the appropriate bacteria is everywhere abundant. To secure the development of a sufficient number of them it is just as unnecessary to supply more seed as it is to scatter seed of "pusley" in the garden to secure a crop of that weed. It is only when a legume is new in a given locality that it becomes necessary to consider the question of supplying seed of its appropriate bacteria; for while some of the bacteria seed may be present, adhering to the seed of the new crop in the form of dust, the quantity will be insufficient for the best results the first few years.

To supply this deficiency the farmers of to-day may easily purchase nitragin, often spoken of as a germ fertilizer, or he may secure soil from the locality where the new crop is known to flourish. Nitragin is not expensive, and if used according to directions accompanying it, it has often been found beneficial. The quantity of earth needed is not large, and if scattered and mixed with the soil, as fertilizer would be, it will usually produce the desired effect.

In one other important particular green-manuring has a relation to the supply of nitrogen in the soil. This element is rapidly converted into soluble forms during the summer, and the soil has not the ability to retain these soluble compounds. If the rainfall is heavy and water leaches through the soil it will take these soluble nitrogen compounds with it.

This loss can be prevented by keeping the soil filled with feeding rootlets of growing plants. The myriad hungry rootlets will take up the soluble nitrogen and it becomes a part of the plant. It is locked up, so to speak, in the vegetable tissues, and will remain so locked up until these tissues decay.

As has been pointed out, the season when this loss is most likely to take place is in the late autumn; hence, to prevent this loss, or for *nitrogen conservation*, those crops are most valuable which are not affected by the autumn frosts and which will continue to grow as late as possible. Measures to insure nitrogen conservation are self-evidently most important upon the richer soils which are light and porous in character and which have open subsoils.

Green-manuring cannot increase the store of either phosphoric acid, potash or lime, but it can be made to increase the solubility and therefore the availability of these soil constituents. The feeding roots of growing plants are furnished with a small amount of acid and this acid takes hold of and makes soluble elements which are not soluble in pure water. The elements so made soluble become a part of the growing crop, and when that crop decays they become available to the succeeding crop, whose labor is therefore lightened because it finds a larger store of available plant food than would have been present had not the green-manuring crop been grown.

Green-manuring increases the store of humus (partially decayed vegetable matter) in the soil, and humus is necessary to the best conditions of fertility and productiveness. It increases the capacity of the soil to retain and conduct water; it promotes beneficial chemical changes among the different soil constituents; changes which result in making originally inert soil materials available as food for plants. A suitable amount of humus contributes largely to the production of that physical condition of the soil which makes it possible to bring it into good tilth and to maintain it in that condition.

The products of the decay of the vegetable matter furnished by green-manuring exert a very beneficial effect upon the soil. Among the most important of these products is carbonic acid. This acid helps to keep the soil chemically active, *i. e.*, to produce beneficial chemical changes which result in making more food available. This acid, further, helps largely to dissolve the useful constituents of the soil, especially the lime and phosphates, thus bringing them within the reach of subsequent crops. This acid further attacks the stones and rocks of the soil, helping to disintegrate them. This action is especially important in the case of all rocks and stones containing lime.

The green-manuring crop is useful, further, because while it occupies the land the conditions are more favorable for those processes of fermentation which exert a beneficial influence upon the soil. These processes are favored by the shade furnished by the crop, by the restricted circulation of the air and by the more uniform soil temperature which the occupying of the land by a crop secures. The incorporation of the vegetable matter of the green crop in the soil may be the means of warming it. The darker color resulting from the presence of humus

favors the absorption of heat from the sun, and the process of decay, being in its final effect precisely like combustion by fire, helps to raise the temperature of the soil.

Many of the most valuable green-manuring crops are distinguished by the fact that they send their roots into the soil to an enormous depth. Such crops are highly beneficial in two ways: first, by means of their deep roots they bring up from the subsoil food not available to ordinary crops, but having been thus pumped up, as it were, it becomes available to succeeding shallow-rooted crops: second, it has been found that crops which are ordinarily shallow-rooted send their roots much deeper than usual when they are made to follow a deep-rooted green-manuring crop. Thus, for example, Schultz-Lupitz has noticed that the roots of the potato, which ordinarily develop almost entirely near the surface, penetrate deeply into the ground after a crop of lupines, following the furrows left by the decay of the roots of the lupines. This renders the potato less liable to injury from drought, increases enormously the store of food within its reach and so makes the crop more certain and larger.

Green-manuring may be made the means of cleansing the field from weeds, for which purpose, of course, as has been pointed out, only the crops of the most rapid growth are useful. Green-manuring increases the store of organic matter in the soil, and so furnishes the conditions favorable for the multiplication of earth worms, and these, as Darwin has pointed out, by their activities improve the soil in many ways; most important among which are better aeration, bringing of the finer materials to the top, pulverization and increased solubility of its constituents.

Finally, green-manuring may be made to protect the soil from the injurious action of violent winds and from surface washing, for which purposes, as has been pointed out, those crops which occupy the land in winter are by far the most useful, although those which are killed by frosts, if allowed to remain upon the surface during the winter, will prove useful in the same direction.

The list of possible benefits from green-manuring, it will be seen, is a long one, and these benefits are undoubtedly, under the proper conditions, very great. It may be wondered then why the practice is not more general. It might seem that the benefits are sufficiently great to warrant a much more general practice of green-manuring than we find among our farmers; and yet the indiscriminate adoption of the practice is by no means to be recommended. It has its place; but the conditions under which it is best to turn under a catch-crop are, I believe, comparatively seldom met with.

CONDITIONS UNDER WHICH GREEN-MANURING SHOULD BE PRACTISED.

In the majority of instances a crop which has been grown will be worth more to feed in Massachusetts than it is for turning under. A crop standing in the field has a certain value as a means of soil improvement, — a certain manurial value. It has also, in almost all cases, a certain value as food. It may be used as a food either by pasturing it or cutting in the barn. In either case, under proper management the excreta of the animals consuming the crop will be worth as manure

about three-fourths as much as the entire crop would be worth if incorporated in the soil. If we turn the crop under, then, in the one case, we get its full manurial value. If, on the other hand, we feed it and carefully save and apply the excreta, or if we pasture and so manage that the droppings are evenly distributed, we have the food value and about three-fourths of the manurial value. The sum of these two in the great majority of instances will be greater than the full manurial value.

There are, of course, conditions under which the crop cannot be profitably fed, either because of the absence of stock necessary to consume it or because of the location of the field. In such cases the turning under of the entire crop may, of course, be wisest.

There can be no doubt that the latter practice is much more often in place upon light and sandy soils than upon the better soils. Upon the light and poor soils legumes, not finding nitrogen in the soil, are forced to take it from the air. Upon the richer soils they would take it from the soil itself and there would be no essential increase in this element as a result of green-manuring.

This has been very strikingly shown by Julius Kühn. Kühn's experiments were carried out in 1891 at Halle, Germany. The soil was a good medium loam. It had produced wheat in 1890. After the wheat was harvested a mixture of 194 pounds of peas, 44 pounds of vetch and 35 pounds of yellow lupine seed per acre was sown. The resulting crop was ploughed under the last of October and rye was sown. The quantity of green material ploughed in amounted to 8,650 pounds per acre. This supplied about 50 pounds of nitrogen. In the spring of 1892 the field was sown to barley, and also an adjoining field not green-manured. The crops were practically equal under the two methods of treatment. In this case, then, green-manuring produced no appreciable benefit. Kühn estimated that the crop ploughed in would have been worth for feeding about thirteen dollars per acre.

On the other hand, the same experimenter found that on a sandy loam soil green-manuring with field peas sown in the rye stubble after harvesting increased the crop of barley the following year to the same extent as an application of about 175 pounds of nitrate of soda. In the latter case green-manuring paid, while in the first it was attended with loss.

Numerous experiments in the United States, a few of which will be noticed later, establish beyond a doubt the possible benefits of green-manuring upon the lighter and poorer soils. It is important to point out, indeed I have already, in what has been said concerning eating one's cake and having it too, called attention to the fact, that even when the catch-crop is fed the manurial value of its stubble and roots may be considerable. Especially is this true concerning the legumes (clover-like plants).

A great deal of work to determine the manurial value of the stubble of different crops has been carried out at the Storrs School Experiment Station, Connecticut. Some of the leading results of Professor Wood's investigations are shown in the following table:—

Amount of Roots and Stubble and Valuable Ingredients left in One Acre.

KIND OF PLANT AND PORTION ANALYZED.	Roots and Stubble (Water- free).	Nitrogen.	Phos- phoric Acid. P ₂ O ₆ .	Potash. K ₂ O.
	lbs.	lbs.	lbs.	lbs.
Timothy and redtop, stubble and total roots to depth of 3 feet,	8,223	90.1	25.2	55.8
Buckwheat, stubble and roots to depth of 1 foot,	483	4.4	1.3	3.8
Cow pea, stubble and roots to depth of 28 inches,	1,904	25.9	7.5	20.6
Clover, stubble and total roots to depth of 3 feet,	2,906	60.2	15.1	45.4
Vetch, stubble and roots to depth of 22 inches,	1,555	27.2	7.2	27.7
Yellow lupine, stubble and roots to depth of 30 inches,	1,429	15.7	4.9	23.4
Blue lupine, stubble and roots to depth of 30 inches,	1,256	10.7	2.9	12.5
White lupine, stubble and roots to depth of 30 inches,	1,034	11.0	1.9	10.7
Horse bean, stubble and roots to depth of 22 inches,	1,759	31.8	6.1	19.5
Soy bean, stubble and roots to depth of 22 inches,	701	8.6	2.2	5.7

It seems desirable to remark, in connection with this table, that while the work was no doubt accurately done it appears doubtful, in view of known facts and the results of others, whether the results of these investigations do justice to the plants of the clover family. Indeed, in his report the author quotes results of other investigators, showing several times more nitrogen in roots and stubble of clover than his own investigation discovers. Thus, for example, Dr. Voeleker of England is quoted as reporting 100 pounds of nitrogen per acre in the roots only of clover, while Dr. Weiske of Germany is quoted as reporting 180 pounds in the roots and stubble. Dr. Weiske is also quoted as reporting in the roots and stubble of rye 62 pounds of nitrogen per acre, of barley 22 pounds, of oats 25 pounds, of buckwheat 45 pounds, of peas 53 pounds and of lupines 58 pounds. Though differing in detail all these results demonstrate, in a striking manner, the fact that the stubble and roots have a large manurial value. It would seem, therefore, in the great majority of instances that the feeding of the catch-crop, the careful saving and application of the excreta of the animals consuming it, together with the manurial value of the stubble and roots, will give us the largest possible returns.

The most important among the various crops which may be appropriately considered under our subject are the following: rye, oats, barley, Hungarian grass, millets, buckwheat, white mustard, rape, English turnips, spurry, vetches, peas, lupines, serradella, crimson clover, sweet clover and red clovers. Possibly used for the same purposes, although requiring a much longer season than most of the above-named crops, may be mentioned the cow pea, the horse bean and the soy bean.

It remains now only to point out the particular uses and adaptations of each of these crops, to give directions for sowing them and a statement, so far as experimental results allow, of the beneficial effects obtained in this country by their cultivation.

Rye. — Rye is one of the most useful catch-crops. It is not capable of assimilating atmospheric nitrogen and so cannot enrich the soil in that

element, but it may serve nearly all the other useful purposes for which green-manuring crops are cultivated. It is also a fairly valuable fodder crop, and may be either pastured in fall or in spring or cut and fed. The quality which renders it particularly valuable as a fodder crop is its earliness. It can often be cut in this latitude for feeding as early as May 10, which is much earlier than almost any other crop. As is generally well known, however, the nutritive value of rye fodder is low and it is not palatable except when young. So soon as it is well headed out cattle find it unpalatable. Rye is especially valuable as a means of nitrogen conservation and in affording covering and protection in winter, preventing both damage from wind and washing. It is suited to light soils. It is not deep rooted and so will not bring up soluble food from below to any considerable extent. It may be sown any time from about the middle of August to the first of November, the quantity of seed varying according to the soil and season from two to three bushels.

Oats. — Oats as a catch-crop are comparatively unimportant. They are sometimes sown in July or August to furnish green feed in autumn, but in this part of the State at least they are very susceptible to rust and the results have generally proved unsatisfactory. Oats are quite hardy and will continue to grow until the ground freezes. They may therefore serve the purpose of nitrogen conservation. They grow quickly and may therefore be employed as a green-manuring crop, but they have no power to take nitrogen from the air and cannot be considered particularly valuable. They are suited to medium and moderately heavy soils. From two to three bushels of seed to the acre are required.

Barley. — Barley is not infrequently grown as a catch-crop with satisfactory results. Sown in July or August it generally proves more satisfactory as a green fodder in autumn than oats. We have found it less liable to rust. Barley hay is considered excellent by those who have used it, but on the whole it is to be regarded as inferior in importance to Hungarian grass and the millets as a source of hay. As a green-manuring crop its position is about the same as that of oats. It cannot enrich the soil in nitrogen, but growing until the ground freezes it may conserve soil nitrogen. It is suited to moderately light and medium soils, and from two to three bushels of seed per acre are required.

Hungarian Grass. — Hungarian grass is probably more often grown as a catch-crop in Massachusetts than any other. When the farmer sees that he is likely to be short of hay he most frequently sows Hungarian grass, and this kind of millet (for it is a millet) fairly deserves the reputation which it enjoys. It is a very quick grower and is finer, therefore more easily made into palatable hay, than most of the other millets. It may also be used as green feed, though for this purpose it must be considered inferior to the Japanese barn-yard millet. Hungarian grass is recommended sometimes for green-manuring, but for this purpose it has nothing special to recommend it save its quick growth. It cannot gather nitrogen, it is killed by frost and so is not a nitrogen conserver, and it is not deep rooted. It is suited to light and

medium soils, and from one-half to three-fourths of a bushel of seed is required per acre.

Millets. — The number of varieties of millet is very large. We have tried within the last few years twenty-five different kinds. The most important of these, together with the yield in 1896, are shown in the following table, which gives also the quantity of seed, the height of the plants and the date of cutting:—

Millets, Variety Tests (Plots One-sixteenth Acre Each).

	Quantity of Seed (Quarts).	Height of Plants (Inches).	Date of Cutting.	Yield of Hay (Pounds).
Canary bird seed,*	2	30	Aug. 25,	295
Early harvest,	2	36	Aug. 4,	325
Mukodamaski (Japanese),	2	42	Sept. 8,	640
Golden,	2	54	Sept. 8,	610
Golden Wonder,	2	48	Aug. 13,	480
Hokkaido (Japanese),	2	47	Aug. 25,	430
Japanese common,	2	48	Aug. 25,	475
Hungarian,	2	39	Aug. 13,	550
Japanese white broom corn,	1½	78	Aug. 31,	840
Chinese,	1½	51	Aug. 4,	460
Common broom corn,	1½	40	July 28,	450
White French,	1½	48	July 31,	310
Red French,	1½	34	July 28,	300
Hog,	1½	37	July 28,	370
California,	1½	37	July 28,	370
Japanese broom corn,	1½	55	Aug. 15,	490
Japanese barn-yard,	1	66	Aug. 13,	620

* In this table the names under which the varieties were advertised are used in the case of all purchased sorts. The Japanese varieties are of our own importation or production.

It should be remarked that in this trial neither the Japanese white broom corn nor the Japanese barn-yard did its best on account of having been sown too thick. Three of these varieties and Hungarian grass were given a trial upon a larger scale, and the results are shown in the following table:—

Varieties of Millet (One-third Acre Each).

VARIETY.	Quantity of Seed sown (Quarts).	Date of Cutting.	Yield of Hay (Pounds).
Hungarian grass,	6½	Aug. 15,	1,730
Japanese common millet,	8	Aug. 26,	2,025
Japanese broom corn millet,	8	Aug. 15,	2,410
Japanese barn-yard millet,	4½	Aug. 15,	2,603

The Japanese barn-yard millet in this trial also failed to do its best on account of having been sown too thickly for a season so favorable for rank growth as was that of 1896.

The Japanese millets require a longer season for growth than common millets or Hungarian grass, and this is against their use as catch-crops. The Japanese broom corn and the Japanese common millets I

consider rather too coarse to make good hay. The Japanese barn-yard millet will make good hay if it can be cured, but it is so succulent that it is extremely difficult to cure and it is not to be recommended as a hay crop. For green feed and to put into the silo it is, however, most excellent. It may be either pastured or cut; the latter I consider best. This millet is enormously productive. Twenty tons per acre of green feed has often been produced upon the college farm, while Geo. L. Clemence of Southbridge reports a yield at the rate of thirty-five tons per acre. As a crop for the silo this millet must be considered valuable. It is more easily grown than corn and makes equally good silage. For the largest crop it must be sown not later than the end of May, although a crop amounting to twelve tons of green feed per acre has been produced from a sowing made as late as July 20. For green feed and for the silo, upon all soils not too dry, this must be regarded as the most valuable of the millets, while for making into hay Hungarian grass is undoubtedly better. As green-manuring crops the millets rank with the Hungarian grass. They have no qualities especially recommending them for this use save that of rapid growth. They are not nitrogen gatherers nor nitrogen conservers.

Buckwheat.—Buckwheat is often introduced as a catch-crop, being distinguished for a specially rapid growth. It is either allowed to ripen or may be left as a green manure. It has only the quality of rapid growth and the ability to thrive upon light soils to especially recommend it as a green-manuring crop. It is not deep rooted, it cannot gather nitrogen, it is killed by frosts and therefore cannot most effectively conserve nitrogen. In spite of these defects it is very frequently employed as a green manure, too frequently perhaps, for there are other crops which are superior to it for this purpose which would better be employed. About one bushel of seed per acre is required.

White Mustard.—This is distinguished for very rapid growth and is suited to light and sandy soils. It will grow usually until about the 10th of November. It cannot gather nitrogen, it is not especially deep rooted, but it is a good nitrogen conserver. It may be either allowed to die down and remain as a soil cover through the winter or it may be ploughed under in November. It furnishes good feed in the autumn for sheep and cattle, but cows cannot be pastured upon it on account of the strong flavor which would be imparted to the milk. The seed may be sown in corn at the time of the last hoeing or cultivation. It will start quickly if the corn is not too thick and by its growth will keep down weeds. It will not itself become a weed. Experiments upon the college farm have shown a slight increase in productiveness as a result of sowing mustard in corn as described. The gain, however, has not been very important. When sown in corn one-half bushel of seed per acre is required.

Rape.—There are two classes of rape, viz., spring and winter. The winter rape wherever it can be grown is an extremely valuable crop. Being sown in the autumn it covers and protects the ground during the late fall and winter, begins to grow very early in the following spring and furnishes a large mass of green material to turn under in season.

for planting most of our crops. Unfortunately winter rape has not been found to be hardy in Massachusetts. Spring rape, the Dwarf Essex variety, has been very successfully cultivated and must be considered a valuable catch-crop. It may be sown either very early in spring to furnish summer pasturage for sheep or cattle, or as a green manure, or it may be sown in summer to furnish fall pasturage or as a means of soil improvement. Rape is hardy and will remain green later than most crops, being particularly valuable therefore as fall pasturage for sheep and lambs. It is not particularly deep rooted, it cannot take nitrogen from the air, but it is one of the best nitrogen conservers. It is also one of the best plants to keep down or to stifle a growth of weeds. Where the soil is clean and in good condition rape may be sown broadcast, but if the soil is weedy it should be sown in drills. For broadcast sowing from three to five pounds of seed per acre are required; when sown in drills from one to two pounds are sufficient.*

English Turnips.—On account of its very rapid growth the English turnip may often be grown as a catch-crop. It is usually possible to produce an excellent crop after early potatoes, with comparatively little labor, by sowing broadcast if the land is clean. The uses and value of this crop are too well known to require further notice.

Spurry.—Spurry is a crop not generally known to our farmers. It is, however, prominent in European agriculture and has been grown successfully in some parts of the United States. It grows with great rapidity and furnishes fodder which may either be cut or pastured in from four to six weeks after sowing. It will thrive upon lighter and poorer soil than most crops. It is sometimes at first not liked by animals, but after becoming familiar with it most of them eat it freely. Horses, however, never like it. As a green manure spurry deserves attention on account of its ability to thrive on poor light soils and because of its rapid growth. It is not a nitrogen gatherer nor is it important as a nitrogen conserver. The Michigan Experiment Station † reports very successful experiments in improving the light sandy soils known in that State as the "Jack pine plains." After ploughing in crops of spurry, following crops of grass and wheat have been very greatly improved. From six to eight pounds of seed is sufficient. Spurry has been grown upon a small scale on the college farm at Amherst but made too small a growth there to render it valuable.

Vetch.—There are two classes of cultivated vetch, viz., spring and winter. Both are valuable and the winter vetch is hardy on all well-drained soils in Massachusetts. Vetch is suited to medium or heavy soils. Neither the spring nor winter vetch will do very well without a fairly liberal supply of moisture. The vetch belongs to the clover family and is a nitrogen gatherer. By means of this crop the soil can therefore be enriched. Both the spring and winter vetch are valuable for fodder

* Farmer's Bulletin No. 11, issued by the United States Department of Agriculture in Washington, gives much valuable information concerning rape which might be quoted did space allow, but I am compelled to refer those desiring further information to that Bulletin.

† Bulletin No. 91.

as well as for green manuring. The spring vetch, as is generally known, is commonly sown with oats or barley, about one bushel to the acre, and winter vetch may be sown with winter rye, the same quantity of seed to the acre. When first grown upon the farm vetches may not do well on account of the insufficient development of the bacteria which are essential to vigorous growth. After a few years it may be expected that these bacteria will become abundant and the growth will be better. It is the winter vetch which is likely to be of most value as a green manure, for besides serving as a nitrogen gatherer it will serve also as a nitrogen conserver and will furnish protection to the soil in winter. It grows early in spring, starting up with the rye, and can be turned under in season for corn and similar crops to follow. The following table shows the increase in rye by green manuring with vetch, and several other crops which are to be spoken of, upon a sandy soil in Germany:—

Increase in the Yield of Rye per Acre on Green-manured Plots over those not Green-manured.

KIND OF GREEN MANURE.	Date when ploughed under.	Increase in Grain (Pounds).	Increase in Straw (Pounds).
Yellow lupine,	Sept. 28,	1,101	1,261
Blue lupine,	Sept. 28,	1,343	1,963
White lupine,	Sept. 28,	1,352	2,137
Serradella,	Sept. 28,	1,241	1,845
Crimson clover,	Sept. 28,	903	1,620
Vetch,	Sept. 28,	1,077	2,122

The vetch in this experiment was spring vetch, sown May 15, at the rate of 18 pounds per acre with about one-third of its weight of rye to act as support for the vetch plants. It will be seen that the increase in crop was very large. This is no doubt chiefly to be ascribed to the fact that the vetch stores up a large amount of nitrogen taken from the air.

Concerning the value of vetch as fodder it seems unnecessary to go into details. It is similar in its composition to clover and is relished highly by cows. It can easily be made into hay as the stems are comparatively fine. About one bushel of seed per acre is commonly required.

Peas.—The common field pea, though requiring a rather longer season for development than most of the crops we are considering, is nevertheless sometimes valuable as a catch-crop. This crop is valuable as fodder and may be used either green or made into hay. Curing is more difficult than in the case of vetch on account of the coarser vines. Peas do best upon medium or heavy soils. This crop is a nitrogen gatherer and is sufficiently hardy so that it may serve also the purpose of nitrogen conservation. The pea is so well known that further notice appears unnecessary. The quantity of seed required is from one and one-half to two bushels per acre.

Lupines.—The cultivated lupines are all annual plants while our native wild lupine is perennial. Of the cultivated lupines there are three distinct sorts, the white, the blue and the yellow. Lupines do

best upon the medium or lighter soils. They are very deep rooted. They are nitrogen gatherers but are killed by frosts and therefore cannot serve as nitrogen conservers. Lupines have little fodder value. They are not palatable to most classes of animals though sheep may be fed a moderate amount of them. They make a very quick growth, and are, because of this and the other qualities named, among the most valuable crops for the improvement of the lighter soils. The table above given shows how large an increase in the succeeding grain crop they are capable of producing when cultivated under the right conditions. About one bushel of seed per acre is sufficient.

Serradella. — This crop is much prized in some parts of Europe, but while it must be admitted that it is a valuable fodder and, as shown by the above table, also capable of largely increasing the productiveness of the soil, still on account of the slow growth at first I am not inclined to recommend it. Unless it can be weeded and cultivated at the start it is likely to be stifled by the weeds upon all ordinary fields. It seems, further, that our drier climate is less favorable to its growth than the more humid European climate. Nine pounds of seed per acre is sufficient.

Crimson Clover. — Concerning no crop brought to the attention of farmers in recent times has so much been said and written as of this plant. Under the right conditions it is undoubtedly a valuable fodder and one of the most valuable green-manuring plants. The above table shows a large increase in the succeeding crop due to its cultivation. In the United States there have been many reports of success in soil improvement by its cultivation. Perhaps in none of these were more striking results obtained than in an experiment reported by Professor Neale of the Delaware Experiment Station.* I quote from that report as follows: —

“Eight tons 600 pounds of crimson clover from seed, which cost \$1 per acre, added 24 bushels to the corn crop. One dollar invested in nitrate of soda and used as a top-dressing added 6 bushels to the corn crop. Hence, in this case \$1 invested in clover seed returned four times as much as \$1 invested in nitrate of soda. As to the relative amount of labor involved, the sowing of the seed and the broadcasting of the nitrate of soda possibly balance each other. Ploughing down a green crop is doubtless far more costly than ploughing bare ground. This drawback may reduce the above-named apparent gain 25 per cent.”

In Delaware, crimson clover appears to be perfectly hardy; it is uninjured by the winter; but in most parts of Massachusetts this clover is not found to be hardy. It is only in those localities where it can stand the winter that crimson clover is likely to prove of great importance. In such localities it will prove valuable both as a fodder crop and for green-manuring. As a fodder crop it would be valued chiefly because it is ready to cut earlier in the spring than any of our other clovers. Feeding it in large quantities, however, has in a few cases been found injurious on account of the balls of hairs from the heads which form in the stomach or intestines. Crimson clover is a nitrogen gatherer. It is

* Delaware Experiment Station Report for 1892.

not injured by moderate frosts, and is therefore a nitrogen conserver; it is deep rooted and it grows so early and so rapidly in spring that a large bulk of green material may be turned under in season for planting corn and other crops which are planted at about the same time. If sown in spring crimson clover will make one or more good crops upon suitable soil. In order to secure more than one it must, however, be cut about as soon as it begins to blossom. If allowed to ripen any seed it dies, and in any event it will live but one season. Some recommend growing crimson clover in this way in localities where when fall sown it is winter-killed, but it can not be regarded as particularly valuable save where it will pass through the winter. The quantity of seed required is about twenty pounds per acre.

The common, red, alsike and mammoth clovers are perhaps not properly speaking catch-crops. They are, however, valuable crops for purposes of soil improvement, and since so much has been said in this paper upon that subject it seemed desirable to mention them. They are all deep rooted, they take nitrogen from the air, they conserve nitrogen, they serve for winter protection of the soil, and must be looked upon as among our most valuable crops for soil improvement. They are particularly deserving of attention on account of the large quantity of the different elements of plant food left behind in their stubble and roots, as shown by the table previously given. Methods of sowing and management are too well understood to demand attention here.

Sweet Clover. — This crop is as yet but little known and cannot be said to have passed through the experimental stage in this locality. It is believed, however, that it may prove a valuable crop for soil improvement. It takes nitrogen from the air, it is very deep rooted, it is hardy in winter and will therefore conserve nitrogen and serve for soil protection, it starts very early in the spring and grows with great rapidity. On the tenth of June this year the average height in a field upon the college farm was two and one-half feet, and at that time it was increasing in height at the rate of an inch a day. Corn for the silo may be put in from June 10 to 20 with every prospect of success, and it may be doubted whether any nitrogen-gathering crop will furnish so much green material to be turned in previous to these dates as will the sweet clover. European experimenters report very favorable results from green-manuring with sweet clover on heavy soils. In one experiment in Germany, the results shown in the following table were secured with oats: —

Yield of Oats and Straw per Acre with Different Manuring.

TREATMENT.	Grain (Pounds).	Straw (Pounds).
Without green-manuring, no fertilizer,	1,099	1,748
Green-manuring, no fertilizer,	1,645	3,381
Green-manuring, 322 pounds Thomas slag,	1,901	3,186
Without green-manuring, 161 pounds nitrate of soda (harrowed in),	2,723	5,003
Without green-manuring, 161 pounds nitrate of soda (as top-dressing),	1,591	3,455

It will be noticed that the crop was very largely increased where the sweet clover was ploughed in. Similar results were obtained with potatoes. The quantity of seed required per acre is from twenty-five to thirty pounds. It should be sown from about July 25 to August 10. If sown much later it is liable to winter-kill. It is believed that under the right conditions it will give good results when sown in corn at the last cultivation but this has not yet been demonstrated at Amherst.

The Cow Pea, Horse Bean and Soy Bean — These crops require a longer season for growth than most coming under this class, but all may be valuable as soil improvers and they will therefore be briefly spoken of. To show their probable value and for the purpose of comparing them with one another and with the crimson and sweet clover the following table has been prepared:—

Crops for Green Manuring compared.

CROP.	Green Fodder (Tons).	Nitrogen (Pounds).	Potash (Pounds).	Phosphoric Acid (Pounds).
Cow pea,	10	62	36	20
Soy bean,	10	168	142	40
Horse bean,	12	163.2	84	19.2
Sweet clover,	12	108	101	31.2
Crimson clover,	Hay, lbs. 4,388	84.6	76.2	20.1

Examination of this table shows that the soy bean gives a larger amount of each of the important elements of plant food than either of the other crops under consideration. It furnishes more than double the quantity of each of the important elements of plant food contained in the cow peas. In comparing different crops as soil improvers we have to consider chiefly the amount of nitrogen they contain, for nitrogen is the only important element of plant food which can be increased in amount in the soil by green-manuring.

The cow pea is highly praised in many quarters as a crop for soil improvement. The soy bean, in my opinion, possesses numerous advantages over it for that purpose. The cow pea does not ripen seed here while the soy bean does. It is well known that legumes take nitrogen from the air in largest proportion as they approach maturity, hence the crop which matures will enrich the soil in this element to a greater extent than one which does not. The cow pea, while doubtless valuable further south, both for fodder and for green-manuring, is therefore believed to be inferior to the best varieties of the soy bean for these purposes.

The number of varieties of this bean is large. Among those experimented with at Amherst the medium green proves to be best. This is confidently recommended for fodder, to be used green or to be put into the silo with corn or with millet, or for green-manuring. It must be planted in drills, it does best upon medium or moderately heavy soils and about one-half bushel of seed per acre is required.

The horse bean is not recommended for Massachusetts as it seems to be subject to blight which seriously lessens its productiveness.

MASSACHUSETTS
CROP REPORT

FOR THE

MONTH OF AUGUST, 1898.

ISSUED BY

WM. R. SESSIONS,

SECRETARY STATE BOARD OF AGRICULTURE.

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CROP REPORT FOR THE MONTH OF AUGUST, 1898.

OFFICE OF STATE BOARD OF AGRICULTURE,
BOSTON, MASS., Sept. 1, 1898.

Bulletin No. 4, Crop Report for the month of August, is herewith presented. Particular attention is called to the article on "Tuberculosis and the Milk Supply," by George M. Whitaker, M.A., acting executive officer, Massachusetts Dairy Bureau, which is printed at the close of this bulletin.

PROGRESS OF THE SEASON.

The August returns of the United States Department of Agriculture (Crop Circular for August, 1898) give the average condition of corn as 87. This is 3.5 points lower than last month, 2.8 points higher than on Aug. 1, 1897, 9 points lower than on Aug. 1, 1898, and six-tenths of one point below the August average of the last ten years.

The average condition of spring wheat is 96.5. This is 1.5 points higher than last month, 9.8 points above the average on Aug. 1, 1897, 17.6 points above that on Aug. 1, 1896, and 13.5 points above the August average of the last ten years.

The average condition of oats is 84.2, as compared with an average of 92.8 last month, with 86 on Aug. 1, 1897, 77.3 on Aug. 1, 1896, and 83.7, the August average of the last ten years. The proportion of the oat crop of last year still in the hands of farmers is estimated at 6.4 per cent, as compared with 10.1 per cent of the crop of 1896 in farmers' hands one year ago.

The average condition of barley is 79.3, as compared with 85.7 last month, with 87.5 on Aug. 1, 1897, with 82.9 on Aug. 1, 1896, and with 86, the August average of the last ten years.

The average condition of spring rye is 93.7, which is 3.2 points below that of last month, but 3.9 points higher than on Aug. 1, 1897, 5.7 points higher than on Aug. 1, 1896, and 6.4 points above the August average of the last ten years. Of the States of principal production, Iowa alone falls below the average of a series of years.

The preliminary returns regarding buckwheat indicate a reduction of 5.5 per cent in the acreage of this crop from last year. There is a reported decrease of 6 per cent in New York and of 1 per cent in Pennsylvania, which two States produce about 70 per cent of the entire crop. The average condition is 87.2, against 94.9 on Aug. 1, 1897, 96 on Aug. 1, 1896, and 90.2, the August average of the last ten years.

The average condition of Irish potatoes fell during the month of July from 95.5 to 83.9. This latter condition is 6 points higher than that of Aug. 1, 1897, 10.9 points lower than the condition on Aug. 1, 1896, and 3.2 points below the August average of the last ten years.

The reports as to sweet potatoes are not sufficiently complete to warrant the establishment of an average of condition for the entire country, but, with few exceptions, they are very favorable.

Taking the entire cotton-producing region as a unit, the condition of the crop on August 1 was exactly the same as on July 1, namely, 91.2. This is 4.3 points higher than on Aug. 1, 1897, 11.1 points higher than on Aug. 1, 1896, and 5.8 points higher than the August average of the last ten years.

No average condition of tobacco for the entire country can be established, but there has been a decline in nearly all the principal tobacco-growing States during the month of July.

Preliminary returns indicate a total area of the hay crop, mown or to be mown, eight-tenths of one per cent greater than last year. The average condition of timothy, 99.3, has no parallel in the records of the department. The production of clover is likewise very high, being 97 per cent of a full crop.

In the average condition of pastures there has been a general decline during July.

The reports as to the apple crop are increasingly unfavorable, and the apple-growing States in which the conditions are at all favorable are few in number.

In Massachusetts the average condition of corn August 1 is given as 96; the average condition of spring rye as 96; the average condition of barley as 98; the average condition of oats as 93; the acreage of buckwheat as compared with last year as 95 and the condition as 98; the average condition of potatoes as 96; the acreage of hay as 102; the average condition of timothy as 113; the production of clover compared with last year as 110 and the quality as 101; the average condition of pasture as 104; and the average condition of apples as 71.

TEMPERATURE AND RAINFALL FOR THE WHOLE COUNTRY.

[FROM UNITED STATES CLIMATE AND CROP BULLETINS.]

Week ending August 1. — The week was cooler than usual on the immediate coast of northern California, generally throughout the Missouri and Mississippi valleys, including portions of the Rocky Mountain slope and the upper Lake region, also slightly cooler than usual in eastern Maine. The week was decidedly warmer than usual in the lower Lake region, the Middle Atlantic States and over the greater part of the Pacific coast and southern plateau regions. Abundant rains fell over the greater portion of the Gulf States, in the central Mississippi, lower Missouri and Ohio valleys, and generally throughout the Middle Atlantic States and lower Lake region. Elsewhere less than the usual amount of rain fell, and there was a general absence of rain throughout the Rocky Mountain and Pacific coast regions. The week was decidedly favorable to corn. Cotton suffered from excessive rains. Tobacco improved greatly in the principal tobacco States.

Week ending August 8. — The week was warmer than usual on the north Pacific coast, over the Middle plateau region, on the west Gulf coast, in the lower Lake region, upper Ohio valley, and on the Atlantic coast northward of Florida. The week averaged cooler than usual generally throughout the Missouri and Mississippi valleys, eastern

Rocky Mountains, southern plateau region and in California. More than the usual amount of rain fell over the eastern Rocky Mountain slope, lower Missouri and upper Mississippi valleys, Lake region, New England, Middle Atlantic States, and over the greater portion of the Gulf States. Less than the usual amount fell in the south Atlantic States, portions of the lower Ohio and lower Mississippi valleys, upper Missouri and Red River valleys. No rain fell on the Pacific coast. Corn continued to make excellent progress. Cotton suffered from excessive rains. Tobacco was in a very promising condition.

Week ending August 15. — The week was cooler than usual in the upper Lake region, central valleys, central Gulf States, and over portions of the Middle Atlantic States and south-eastern Rocky Mountain slope. The week averaged slightly warmer than usual in New England, and was decidedly warmer than usual over the western portions of the northern and middle plateau regions and the greater part of California. Except over areas of limited extent, confined principally to the southern States, there was more than the usual amount of rain in the districts south of the Ohio and east of the lower Mississippi River, including the Middle Atlantic States and southern New England. Over northern New England, the greater part of the Lake region and generally to the westward of the Mississippi River the rainfall was below the average. The week was generally favorable to corn. Cotton continued to suffer from excessive rains and lack of sunshine. Tobacco generally did well.

Week ending August 22. — The week was warmer than usual throughout nearly the whole of the country, the exceptions being a portion of the middle and north Pacific coast region and on the south Atlantic coast, where it was slightly cooler than usual. In the Gulf States nearly normal temperatures prevailed. There was less than the usual amount of rain generally throughout the central and west Gulf States, in the central Mississippi and lower Ohio valleys, and over portions of the Mississippi valley, Lake region, middle Atlantic States, northern New England, and throughout the Rocky Mountain region. Portions of the Lake region, Missouri and central Mississippi valleys received no appre-

ciable amount of rain. Very heavy rains occurred over the eastern portions of the Dakotas, southern New England and portions of the Middle Atlantic and central States. Corn generally did well, though there was some damage from excessive heat and drought in Nebraska, Kansas and Missouri. Tobacco showed a general and decided improvement.

SPECIAL TELEGRAPHIC REPORTS.

[WEATHER BUREAU, BOSTON.]

Week ending August 1. — New England. Boston: Rain much needed in New Hampshire and Vermont, where all crops are suffering; excellent conditions in remainder of district, crops growing fast; showers and damp weather causing standstill; fourth crop of hay yet to be secured.

Week ending August 8. — New England. Boston: Showers made excellent condition in all sections; growing crops generally in fine condition; rain needed in parts of Maine, New Hampshire and Vermont; high winds and hail damaged tobacco in parts of Massachusetts and Connecticut; showers delayed haying and did some damage to crop.

Week ending August 15. — New England. Boston: Frequent showers with generally cloudy and warm weather have been favorable to growing crops; haying at a standstill and grain overripe; on account of showers and moist weather, much damage will result to these crops unless followed soon by sunshine; tobacco in good condition and promises a good crop.

Week ending August 22. — New England. Boston: Weather favorable in northern portion, where harvesting and haying are in progress; rain needed in Maine; cloudiness and showers delayed farm work in southern portion, where sunshine is much needed to complete grass and grain harvest; growing crops in excellent condition.

WEATHER FOR AUGUST, 1898.

August, 1898, will long be remembered as a month of extremely disagreeable weather conditions. Not only was the temperature considerably above the usual August normal, but the humidity was excessively high. The last ten

days of the month were particularly disagreeable. The rainfall was also excessive and the local thunderstorms were numerous and severe. The shower of the 17th was particularly severe in Boston and immediate vicinity; many buildings were struck and at Waltham a man was killed. Hail accompanied this storm, but the stones were not large enough to do any appreciable damage. In western Massachusetts the monthly rainfall was considerably less than in the central and eastern portions of the State. At Concord, Mass., the rainfall on two days during the month exceeded 2.5 inches, bringing the total for the month up to nearly 10 inches. The average temperature for the first twenty-five days of August at Boston was 73.2° , — between 3° and 4° above the normal. The winds were of moderate velocity and mostly from the south-west. The amount of clouds was above the average.

In the circular to correspondents returnable August 23 the following questions were asked:—

1. What is the condition of Indian corn?
2. What is the prospect for rowen, as compared with former years?
3. What is the prospect for late potatoes, and have you noticed blight or rot?
4. How do the acreage and condition of tobacco compare with former years?
5. What is the prospect for apples, pears, peaches, grapes and cranberries?
6. What is the condition of pasturage in your vicinity?
7. How have oats and barley compared with former years?
8. Do your farmers pay much attention to poultry, and what proportion does the income derived from poultry products bear to that from dairy products?

Returns were received from 172 correspondents, from which the following summary has been made:—

INDIAN CORN.

Indian corn is looking well as a whole, and will probably be nearly, if not quite, a normal crop. It is backward in

some sections, but with good weather promises to yield well even there. There is some complaint of injury from excessive rains on low land, and also some complaint of injury from high winds; but these reports are scattering, and do not indicate any material reduction of the crop from these causes.

ROWEN.

The rowen crop will be equal to the phenomenal crop of last year in most sections, and in many will even exceed it. The only exceptions to the uniformly good condition reported are where the first crop was not cut until late, owing to bad weather. With good weather for cutting rowen should be of excellent quality. In some cases the first crop has not been cut and will not be, because of delay from bad weather and also on account of the large supply of hay the present season.

LATE POTATOES.

Late potatoes promise to be a better crop than last year, but will hardly be up to the normal. There is considerable complaint that the tubers are small and not set well, which will, of course, keep down the yield. Blight also appears to be quite common, though perhaps not general over the State. Rot is reported in some sections, but is not general, and good, clear weather would do much to minimize the loss from this source.

TOBACCO.

Seldom, if ever, has there been as good a crop of tobacco reported as that of the present season. The crop has made a fine growth, and shows a broad, fine leaf, of good color, and remarkably free from worm and flea work, and there appears also to have been a minimum of injury from wind and hail. At the time of making returns cutting was well under way in most sections and is probably now practically completed.

FRUITS.

The condition of the apple crop has not changed much during the past month, and the crop will be a small one for a bearing year. Pears also will be rather a light crop. While there are some good yields of peaches reported, the

orchards generally fail to show an average crop and many are entire failures. Grapes promise well if the season is long enough to allow them to ripen, but they are now rather backward. There were also a few complaints of rot. Cranberries do not promise well as a rule, and the crop will be hardly more than a fair one.

PASTURAGE.

As last year at this time, pastures are in fine condition, seldom, if ever, having been better. There are some complaints that the feed lacks substance and nutritive value, owing to excessive moisture, but in most cases this is balanced by the abundance of the feed.

OATS AND BARLEY.

Oats and barley are hardly normal crops where raised for grain, and there is some complaint of rust and lodging. There is also some complaint of damage from rain in harvesting, particularly to oats. As forage crops they have been highly satisfactory.

POULTRY KEEPING.

There appears to be a constantly increasing amount of attention paid to poultry keeping in all sections, though it is still a side issue in many parts of the State. The principal exception is the south-eastern portion of the State, where much is done in this line, and the income derived from poultry products appears to be fully equal to that from the dairy. It is impossible to give an estimate as to the relative income from these two sources for the State as a whole, owing to the few answers returned to this part of the question. Poultry keeping seems to be generally regarded as profitable, even under the ordinary conditions of neglect prevailing; and it seems to be the general opinion, that with proper care poultry keeping is more profitable than dairying. The correspondent from Easton reports that the keeping of ducks has proved very unprofitable, and that many are giving up that branch of the business.

NOTES OF CORRESPONDENTS.

(Returned to us August 23.)

BERKSHIRE COUNTY.

Sheffield (DWIGHT ANDREWS). — Indian corn is a little late, but is looking well. Rowen is better than an average crop. The prospect for late potatoes is very good, but I have noticed some blight. The tobacco crop is a full average, both as to acreage and condition. Apples and pears promise about three-fourths of the usual average. Pasturage was never in better condition at this season of the year. Oats and barley have not been up to the average, owing to wet weather. Our farmers are paying more attention to poultry than formerly, and think it pays as well as dairying.

Alford (L. T. OSBORNE). — Indian corn is in about average condition. The rowen crop is the best ever seen, conditions having been very favorable. Potato vines are not looking as thrifty as usual, but I have not heard of any rot. Apples promise an average crop and pears a full crop. Pasturage is in the best condition ever known. Oats and barley are average crops, but large quantities were damaged by rain. Increased attention is being paid to poultry; should think the income derived from this source would be about one-eighth that derived from dairy products.

Lenox (ALEX McCONACHIE). — Corn is in good condition, though some fields have been broken by storms. Rowen is as good a crop as last year and better than other years. The prospect for late potatoes is good at present; blight has appeared, but no rot as yet. Apples, pears, peaches and grapes are fair crops. Pasturage is in very good condition. Oats and barley are better crops than last year, but oats have suffered considerably from the rains. Much attention is paid to poultry, and it pays as well as the dairy when properly taken care of. The season has been bad for haying and there are quantities yet to be cut.

Washington (E. H. EAMES). — Indian corn is in good condition. Rowen promises to be about an average crop. The prospect for potatoes is good; but little blight has appeared. Apples and

pears are good crops. Pasturage is in good condition. Oats and barley are about average crops. Our farmers pay but little attention to poultry.

Hinsdale (S. M. RAYMOND). — Corn is in very good condition. Rowen is a very fine crop, but much of it will not be cut. The prospect for late potatoes is very good; have noticed neither blight nor rot. All kinds of fruit will probably give light yields. Pastures are in very good condition. Oats and barley are good average crops. But little attention is paid to poultry, and the income derived from it is small when compared with that derived from the dairy.

Windsor (H. A. FORD). — Indian corn is looking well. Rowen is about as last year and is looking well. Potatoes are nearly all ready to dig; no rot as yet. Apples will be a poor crop. Pasturage is in good condition; flies are troubling cattle considerably. Oats and barley are about average crops. Not much attention is paid to poultry.

Savoy (W. W. BURNETT). — Corn is a little late, but has made a fair growth. Rowen is a full average crop and has made a fast growth. Potato vines look well; a little blight has appeared, but no rot as yet. The prospect is poor for all kinds of fruits. Feed is abundant in the pastures, but is getting old and tough. Oats and barley are about average crops. Nearly all our farmers do something with poultry, and the income is perhaps twenty per cent that derived from the dairy.

Hancock (C. H. WELLS). — Corn is an extra fine crop. Rowen is a better crop than for many years. There is not much blight or rot on potatoes, but the tubers are small as yet. Apples half a crop; pears a fair crop; no peaches, grapes or cranberries. Pastures are in good condition, but most of them have made such heavy growth that feed is not very nutritious. Oats and barley are about average crops. Very little poultry is kept, except by two or three farmers who each have from one to two hundred hens.

Williamstown (S. A. HICKOX). — Indian corn is in good condition. Rowen is a better crop than usual. The prospect for late potatoes is good; have noticed some blight, but no rot as yet. Apples half a crop, pears a three-fourths crop, no peaches, grapes half a crop. Pasturage is in excellent condition. Oats and barley are good crops. Not much attention is paid to poultry keeping.

FRANKLIN COUNTY.

Rowe (J. F. BROWN). — Indian corn is looking better than usual. Rowen is the best it has been for many years. Apples are below

the average; we have no other fruits to report. Pastures are above the average in condition. Oats were mostly hayed for fodder. We think poultry pays as well as any other product of the farm.

Heath (O. D. CANEDY). — Corn is in good condition. Rowen is a good crop. Potatoes are a light crop and are blighting. Apples are a fair crop; pears, peaches and grapes are good crops. Pastures are in very good condition. Oats and barley are good crops. There is considerable poultry raised here, and the margin of profit is not very large on either poultry or the dairy.

Colrain (A. A. SMITH). — Indian corn is in good condition. Rowen is a better crop than usual. Potatoes are a good crop and there is no blight or rot. Tobacco is about an average crop in both acreage and condition. The prospect is poor for all kinds of fruit. Pasturage is in good condition. Oats and barley are average crops. Our farmers pay a good deal of attention to poultry, and many report better profits than from dairying.

Buckland (C. E. WARD). — Indian corn is in excellent condition. Rowen is more than an average crop, if there is good weather to get it in. Potatoes are below the average in yield; some blight, but no rot as yet. There is only one acre of tobacco in town, and that was badly cut by hail. The apple crop is fair back on the hills, but there are not many apples in the valley. Pastures are in first-rate condition. Oats and barley are only raised as forage crops. But little attention is paid to poultry.

Deerfield (CHAS. JONES). — Corn is in good condition. Rowen will be good where the first crop was cut early. Late potatoes have been looking well, but blight is now very general. Tobacco is the best crop for years, with about the usual acreage, and harvesting has now begun. There are but few apples; pears, peaches and grapes small crops. Pasturage is in good condition. Oats and barley are good average crops. There is not much done in poultry.

Whately (FRANK DICKINSON). — Corn is growing fast, but is yellow from too much wet weather. Rowen is a full crop. Potatoes are small and few in a hill; no rot as yet. There is the usual acreage of tobacco, and it is a nice, heavy crop. Pasturage is in the best condition. There is not more than a third of a crop of any kind of fruit. Oats were a light crop. Not much is done with poultry.

Sunderland (J. M. J. LEGATE). — Indian corn is above the average in condition at this time. Rowen is much above an average crop. Potatoes will not be an average crop, as there are but few in the hill; have seen no blight or rot. There is a slight in-

crease in the acreage of tobacco, and the best crop I ever saw standing in the fields; it is as hard to find a poor crop this year as it was to find a good one last. There are very light crops of fruit, with the exception of grapes. Pastures are in very good condition. Very little attention is paid to poultry; almost every one has a few hens, and they have to scratch for themselves.

Erving (C. F. CLARK). — Indian corn is in good condition. Rowen is an average crop. Potatoes are about an average crop; no blight or rot. There is an average crop promised of all kinds of fruit. Pasturage is in good condition. Oats and barley are about average crops. Considerable attention is paid to poultry, and the income derived from it is probably about one-third that derived from the dairy.

Northfield (T. R. CALLENDER). — Corn gives excellent promise of a heavy crop, though it is a little late. Rowen is unusually heavy, and much will remain uncut for lack of storage. Potatoes are late and below the average, and are blighted considerably. The acreage of tobacco is about the same as usual, and the condition the finest since 1892. Apples light and pairs a fair crop. Pasturage is in the best possible condition for the time of year. Oats and barley are not up to the average. Very little attention is paid to poultry. Cucumbers for pickling are yielding well for the first time in three seasons.

New Salem (DANIEL BALLARD). — Indian corn is in good condition. Rowen is more than an average crop. Potatoes promise well, but there is some blight and rot, which may decrease the yield. There is a light yield of apples in most orchards, and but few pears or peaches. Pasturage is in fair condition, with improvement since the recent rains. Oats and barley are good crops. Considerable attention is paid to poultry.

HAMPSHIRE COUNTY.

Prescott (W. F. WENDERMUTH). — Indian corn will be nearly a full crop. Rowen is not as good a crop as last year, but is better than usual. Potatoes are a light crop, with blight on some fields. Apples and peaches are about two-thirds crops; grapes are badly affected with black rot. Pasturage is in very good condition for the time of year. Oats and barley are about average crops. Probably the income derived from poultry products is one-fourth that derived from dairy products.

Belchertown (H. C. WEST). — Indian corn was seldom if ever more promising. Rowen is about an average crop. Potatoes are now looking well, with no blight or rot. Apples are a fair crop,

few pears, no peaches, grapes fair. Pastures are in very good condition, having improved since the July rains. Oats and barley are full average crops. Very little attention is paid to poultry, but those who do give attention to it speak of the hen as far ahead of the cow as a source of profit.

Hadley (H. C. RUSSELL). — Corn is late, but in excellent condition. Rowen is doing well, but the first crop being cut late will lessen the yield. Blight has appeared on nearly all fields of late potatoes. There is a 10 per cent increase in the acreage of tobacco, and its condition is the best for years. There is but little fruit of any kind. Pasturage is in excellent condition. There is an average crop of oats. Not much is done with poultry.

South Hadley (H. W. GAYLORD). — Indian corn is in the best condition it has been for years. Rowen is about half of last year's crop, owing to drought directly after the cutting of the first crop. Blight and rot are doing some injury to potatoes on the heavier soils. Apples and pears about half a crop; peaches light; grapes and cranberries almost a failure. There is feed enough in the pastures, but it is of poor quality. Oats were injured by dry weather and rust. Only three or four in town make a specialty of poultry, and they say the low price of eggs last winter cut into the profits considerably. These men have claimed that \$100 to \$200 invested in poultry paid more profit than the same money in cows, but a large sum like \$1,000 or \$1,500 would probably show a balance on the other side.

Southampton (C. B. LYMAN). — Corn, though late, is large and promises well. Rowen will be a large crop. Late potatoes are looking fairly well; some blight, no rot. Tobacco is being cut and never looked better; some has sold at good prices. Apples are a fair crop, some pears, no peaches, grapes fair. Milk and butter have fallen off in quantity during the month, but there has been a good advance in price. Not enough attention is paid to poultry to make it the source of much income.

Williamsburg (F. C. RICHARDS). — Corn is looking well generally. The prospect is for a good crop of rowen, though not quite equal to last year. Potatoes are a light crop; blighted badly, no rot as yet. Tobacco is looking well, but the acreage is less than last season. Apples are not half a crop, pears nearly a failure, peaches light. Pastures are in good condition, but have fallen off considerably from former conditions. Oats are a full average crop. Not much attention is paid to poultry.

Huntington (H. W. STICKNEY). — Corn shows a great growth of stalk and a fair prospect for ears. A greater growth of rowen has seldom if ever been seen. There is no blight on potatoes as

yet, but if the weather holds hot and wet they will probably rot. Apples are half a crop and grapes have rotted badly. Pasturage was never in better condition. Oats and barley are about the usual crops, though the straw rusted on some pieces. At present prices I should say poultry paid better than dairying.

Plainfield (S. W. CLARK). — Indian corn is a good growth, but is late. The prospect for rowen is very good. Potatoes promise fairly well; have seen no rot. There will be a small or medium crop of fruits. Pasturage is in very good condition. Oats and barley are average crops. Most farmers keep a few hens, but the income derived from poultry is very small compared to that from dairy products. Springs and streams are full for August.

HAMPDEN COUNTY.

Blandford (E. W. BOISE). — Corn stover shows a rank growth, but sunshine and warmth are needed to mature the crop. Rowen is much above an average crop. Potatoes are a light yield, with considerable complaint of blight. Apples promise a fair yield, pears light, peaches small and few. There is rank feed in the pastures, but it lacks flavor and dairy stock is shrinking badly. Oats and barley are below average crops and many fields are rusting badly. Very little is done with poultry.

Russell (E. D. PARKS). — Corn is looking nicely, has grown fast and seems to be earing well. Rowen is up to an average crop or better. Potatoes are not yielding well; some blight, but no rot as yet. Apples are a light crop, but other fruits promise fairly well. Pasturage is in very good condition for the time of year. Much attention is paid to poultry, and poultry products are from 15 to 25 per cent in value of those from the dairy.

Westfield (C. F. FOWLER). — Indian corn is below an average crop, the ears not being well filled out. Rowen is not as heavy as last year, but is a fair average upon early cut land. Potatoes blighted badly and are now rotting somewhat. The acreage of tobacco is a little less than usual, with the condition 10 per cent at least above the average. Apples and pears poor crops, no peaches, grapes fair. There is plenty of feed in the pastures, but it has no substance, owing to wet weather. More attention is paid to poultry than formerly, as many are beginning to make a business of it.

West Springfield (J. N. BAGG). — Indian corn promises well. There is an unprecedented crop of rowen. Potatoes are small and are rotting a little. Tobacco is in first-class condition, with about an average acreage. Apples and grapes are light crops, pears

heavy, peaches scarce. Pasturage is in good condition. Oats and barley show a heavy growth of stalk, but the yield of grain is light. The interest in poultry raising is growing. Frequent rains hinder haying and harvesting, and some hay and grain have spoiled.

Chicopee (R. W. BEMIS). — Indian corn is in good condition. Rowen is a better crop than usual. The prospect for late potatoes is good; no blight or rot as yet. Tobacco is a large crop and is looking well. Apples, pears and grapes are a slim crop in this vicinity. Pastures are in good condition. Oats and barley are good crops, but the weather is bad to get them. The farmers in this vicinity keep quite large flocks of hens, which, with a little care, are productive.

Wilbraham (H. M. BLISS). — Indian corn promises a large crop. Rowen is a large crop. Potatoes are not a full crop, and there is some complaint of rot. Apples, 20; pears, 70; peaches, 90; grapes, 85; and cranberries, 50. Pasturage is in first-class condition. Oats and barley are full average crops. Poultry pays as well as dairying.

Monson (W. M. TUCKER). — Corn is a good growth, but not very well matured as yet, and has been badly blown down by wind and rain. Rowen promises well where the first crop was cut in season. All potatoes will be light and some are blighted. Apples light, pears a fair crop, peaches and grapes look well. Pastures look well, but there has been so much rain of late that feed seems wild and sour. Oats are not as heavy a crop as last year, and rusted somewhat. Poultry is not kept very extensively, few farmers keeping over 100 fowls, and many not half that number. The flow of milk has dropped very materially within the past month, and new milch cows are being picked up close.

Pulmer (O. P. ALLEN). — Indian corn is in very good condition. Rowen is fully up to an average crop. The conditions are favorable for potatoes, and there is but little complaint of rot. The outlook for fruit is not as favorable as usual. Pasturage is in good condition. Oats and barley are about average yields.

Wales (C. F. CRAWFORD). — Corn is looking very well. A few fields which were cut early will yield a good crop of rowen. Potatoes yield lightly and are rotting quite badly. Apples below the average, no peaches, pears and grapes plenty. Pastures are good for the time of year. Barley is a good crop, but oats all appear to be very light. Poultry is of small importance; the income may be 15 per cent that derived from the dairy. Considerable grass is still standing.

WORCESTER COUNTY.

Dudley (J. J. GILLES). — Indian corn promises to be an average crop. Rowen is 25 per cent above an average crop. Potatoes are making a fair yield, and there is very little rot as yet. Apples and grapes are moderate crops; peaches and pears very light. Pasturage is in excellent condition. Oats and barley are light in berry and straw. The majority of our farmers keep only from fifty to sixty fowls.

Southbridge (GEO. L. CLEMENCE). — Corn is broken badly and will not ear well. Rowen is 20 per cent better than an average crop. Potatoes are small and there are indications of rot. Apples are numerous, but small and wormy. Pasturage is in good condition. Oats and barley average well with former years.

North Brookfield (J. H. LANE). — Indian corn is rank in growth of stalk. The dry weather in early July cut rowen off somewhat, but it is a good crop. The prospect for late potatoes is good, and there is but little blight or rot. Pastures are in extra good condition. Apples few, pears few, no peaches, grapes half a crop. Oats and barley are heavy of stalk, but light in grain. Farmers do but little with poultry, though most of them keep a few hens.

Rutland (L. S. DUDLEY). — Corn shows a large growth of stalk and promises well for grain. Early cut fields show a good crop of rowen. Apples seem to be rather a short crop, compared to the bloom in the spring. Pasturage is in good condition. Oats and barley are average crops, though but little of them was left for grain. Poultry is not largely kept.

Templeton (LUCIEN GOVE). — Indian corn is very good as a whole, though a few pieces were injured by high winds. Rowen is much above average years. Potatoes are not a full crop, and blight shows on some fields. Apples three-fourths of a crop, pears light, peaches very light, grapes medium. Frequent rains have kept pastures in good condition. Oats and barley are full average crops. Poultry keeping is not a leading industry, but the income derived from it is one-fourth that derived from the dairy.

Royalston (C. A. STIMSON). — Indian corn is a good crop. The rowen crop is unusually heavy. Potatoes are about two-thirds of an average crop, and blight has attacked many fields. There will be about half a crop of all kinds of fruit. Pastures are above the average in condition. Oats and barley are average crops. While every farmer keeps hens, few make a business of poultry raising.

Westminster (I. DICKINSON). — Indian corn was never better. Rowen will be a large crop. Potatoes are a good crop, and I have noticed neither blight nor rot. There is a fair crop of apples, but

other fruits are light. Pasturage is in good condition. Oats and barley are first-class crops, but the weather is poor for harvesting them. A good deal of attention is paid to poultry raising.

Fitchburg (JABEZ FISHER). — Indian corn is doing very well now. The prospect for rowen was never better. Potatoes make a good show of vines, with little early blight and no rot as yet. There is a small yield of apples, pears and peaches generally, with a few exceptionally good orchards. Pasturage is in unusually good condition. Grapes are yielding well, but showing considerable rot. Every farmer keeps a few fowls, but I am unable to estimate the proportional investment.

Lunenburg (J. L. HARRINGTON). — Indian corn is in excellent condition. Rowen promises to be a large crop. Apples an average crop, pears light; some peach orchards loaded, others very light. Pastures are in excellent condition. Much attention is paid to poultry, which is quite profitable.

Harvard (J. S. PRESTON). — Corn is looking well, though a little backward in growth. The rowen crop is very heavy, much more than in former years. The prospect is good for a large crop of potatoes. Apples, pears and peaches are about half crops; grapes very good indeed. Pastures are in much better condition than usual at the time of year. Oats are cut green for fodder and show a large yield. Poultry is a side issue, our farmers keeping from 50 to 200 fowls.

Bolton (H. E. BABCOCK). — Indian corn is looking well. There has seldom if ever been as large a crop of rowen as this year. Potatoes are looking well and I have noticed no blight. Apples are an average crop, pears plenty, small crops of other fruits. Pasturage is in good condition. Very little oats or barley were left to ripen in this vicinity. Some attention is paid to poultry, but the proportion of profit is not as great as from the dairy.

Clinton (P. B. SOUTHWICK). — Corn is looking finely, but is somewhat backward. Rowen is 50 per cent above an average crop. Some fields of potatoes show signs of blight, but I do not hear of rot. Fall apples plenty, winter apples half an average crop for the bearing year; pears a little below the average; no peaches; grapes look well. Pastures are looking finely. Oats and barley are fair average crops. The majority of farmers do not pay much attention to poultry, but a few say that they get more profit from their poultry than from their dairy.

Worcester (S. A. BURGESS). — Indian corn is in extra good condition. Rowen promises to be a good crop. Late potatoes promise an average crop, but both blight and rot have appeared. Apples poor, pears light, few peaches, grapes average. Pastures

are in extra good condition. Oats and barley are a little less than average crops. Considerable attention is paid to poultry keeping.

Shrewsbury (T. F. MARSTON). — Corn is looking well, but is in need of sunshine. Rowen is a better crop than usual. Potatoes are a good crop, although there is some scab and rot. Very few apples and peaches, pears a fair crop, grapes looking well. Pastures are in good condition. Oats and barley are not as heavy crops as usual. Considerable attention is paid to poultry raising, and the income derived from this source is probably one-sixth that derived from the dairy. Vegetables are looking well, but are greatly in need of fair weather.

Sutton (O. P. JOHNSON). — Indian corn is good, but a little late. Rowen is more than an average crop, but not as good as last year. Potatoes are a very fair crop; no blight or rot as yet. Fruit of all kinds is below the usual average. Pasturage is in excellent condition. Oats and barley are just about average crops. Many pay considerable attention to poultry raising, and in several cases the income from this source exceeds that from the dairy.

Northbridge (H. A. COOK). — Unless there is an early frost there will be a fine crop of corn. Rowen is better than usual. Blight has appeared on potatoes, but it is too early to report as to the final yield. Apples a medium crop, pears light, no peaches, grapes abundant. Pastures never had better or more plentiful feed. Oats were badly damaged by rain. Very little attention is paid to poultry.

Blackstone (O. F. FULLER). — Indian corn is a little backward. Rowen is making a good growth, and will be a larger crop than has been harvested in a number of years. Neither blight nor rot has appeared on potatoes. There will be a fair crop of apples, few pears, and no peaches of any account. Pasturage looks good, although it is a little short. There has been some complaint that oats made a poor growth. There are a number in this town who derive much profit from poultry and who depend on it for their income.

MIDDLESEX COUNTY.

Sherborn (N. B. DOUGLAS). — Indian corn looks fairly well. With good weather to secure it, the rowen crop will be a record breaker. Blight is very general on potatoes, and rot of course follows. Apples are an average crop; other fruits light. Pasturage was never better. Oats and barley are full average crops. The income derived from poultry raising is probably about 10 per cent of that from the dairy. Very little meadow hay has been

cut yet, owing to wet weather, and much hay has been from seven to fourteen days in reaching the barn after cutting.

Marlborough (E. D. HOWE).—Indian corn is more than an average crop. Rowen was never better than this year. The prospect for late potatoes is good, and there is but little blight so far. Apples are about half a crop, pears half a crop, peaches light, and grapes a good crop. Pastures were never in better condition. Oats and barley are both good crops. There are five specialists in poultry in this city; other farmers keep from 25 to 100 hens.

Maynard (L. H. MAYNARD).—Indian corn looks remarkably well. Rowen promises a larger crop than for many years. Late potatoes promise well; have noticed neither blight nor rot. Apples about half a crop; pears and peaches short; grapes and cranberries about normal crops. The rainy weather has made pasturage unusually good. Oats and barley are about normal crops. Some attention is paid to poultry, but the income derived from it is small when compared to that derived from the dairy.

Boxborough (J. F. HAYWARD).—Corn is looking finely. Rowen is more than an average crop. Blight has appeared on potato vines. There will not be as large a crop of fruit as in some years. Pasturage is in good condition. Oats and barley are about average crops. Most of our farmers keep poultry, but I cannot say what proportion the income derived from it bears to that derived from the dairy.

Ashby (ANSON WETTERBEE).—Corn is a little late, but with favorable weather will be above the average. Rowen is more than an average crop. Late potatoes will be rather light, as nearly all fields show blight. Apples, peaches and grapes fair crops; pears light. Pasturage looks as well as usual. Oats and barley are both good average crops, but will be hard to harvest unless there is more dry weather. Considerable attention is paid to poultry, and I should say that the income derived from it was about one-sixth that derived from the dairy.

Westford (ARTHUR WRIGHT).—Indian corn shows a large growth, but is rather late. Rowen promises to be a good crop. Potatoes are looking well, and there is no rot as yet. Apples are a fair crop and peaches light. The old pastures are in excellent condition. Our farmers nearly all keep some poultry.

Carlisle (E. J. CARR).—Indian corn is in good condition. Rowen is much above an average crop. The prospect for late potatoes is good, and there is no blight as yet. Apples are a medium crop, pears few, no peaches, grapes very plenty, cran-

berries medium. Pastures are in extra good condition. Oats and barley were all cut for forage and were very good. Only a few farmers pay proper attention to poultry, but the profits are 75 per cent greater proportionally than those derived from the dairy.

Teuksbury (G. E. CROSBY). — Corn is in good condition, but is not as far advanced as is usual at this season. Rowen is a good crop, even better than last year. The prospect for potatoes is good. Apples are rather light for a bearing year, pears light, no peaches, grapes fair. Pasturage is in excellent condition. Oats and barley are full average crops. Not much attention is paid to poultry; I consider \$50 to \$60 worth of hens as good under ordinary conditions as a cow of the same value.

Bedford (HENRY WOOD). — On dry land the prospect is good for corn, but on low land it has been too wet. The prospect is very good for rowen on land where the grass was cut early. Potatoes are a very good crop, and no blight has appeared. Apples are quite plenty and fair; other fruits not plenty. Pasturage is in good condition, owing to an abundance of rain. Fewer oats and barley were sown than usual, and the crops are not as good. Our farmers do not pay much attention to poultry, and the proportion to dairy products is small. Asparagus looks finely and no rust has appeared.

Woburn (W. H. BARTLETT). — Sweet corn is the variety mostly raised, and is a good crop. The rowen crop was never better. There is some blight and a little rot on potatoes. Winter apples are scarce and there are few pears and no peaches. Pastures are in excellent condition. Oats have done well and Hungarian grass is doing nicely. Farmers generally keep a small flock of hens for their own use.

Stoneham (J. E. WILEY). — Indian corn is above an average crop. Rowen is an unusually heavy crop. The prospect is good for potatoes, and there is very little blight or rot. Apples are a poor crop, pears average and grapes poor. Pasturage is in extra good condition. Oats and barley are light crops. Some of our farmers think that poultry is twice as profitable as the dairy.

Lincoln (SAMUEL HARTWELL). — I have never known as good a crop of rowen as the present one. On high land the crop of potatoes is excellent, on low ground fair to medium. Apples are plenty, but not as fair as some years; pears and peaches scarce; grapes plenty. There is plenty of feed in the pastures, in fact, too much. Some farmers keep considerable poultry.

Newton (OTIS PETTEE). — Indian corn is in good condition. Rowen is a heavy crop. Potatoes are a fairly good crop, with neither blight nor rot. There is about an average crop of apples.

Pasturage is in very good condition. Most farmers keep a few hens for home use, but the poultry business is becoming a specialty more than formerly.

ESSEX COUNTY.

Salisbury (WESLEY PETTENGILL). — Indian corn is of fine color and is looking well, but is late. The rowen crop is equal to last year and much above average years. Late potatoes are looking well, and no rot has appeared. Fall apples are plenty, winter apples less than one-fourth of a crop, pears light, peaches very light, grapes good. Pastures are in excellent condition for the time of year. Oats and barley are good average crops. Farmers in this vicinity go into poultry quite largely, and I should say the income from poultry is nearly one-half that from the dairy.

Hauberhill (EBEN WEBSTER.) — Corn is good on high land, but yellow on low land. I have seen no blight or rot on potatoes as yet. Apples poor, pears medium, no peaches, grapes good. Pastures are in very good condition. Oats and barley are raised for feed and have done well. More attention is paid to poultry than formerly. There has been too much rain for cucumbers, melons and tomatoes.

Groveland (ABEL STICKNEY). — Indian corn is looking finely, and with a favorable September will be all right. The prospect for rowen was never better. No rot has yet been reported on potatoes, but there has been some blight. Apples are a small crop, pears plenty, few peaches, grapes good. Pastures are in good condition, the rains having kept them green. Oats and barley were all cut for fodder and were good crops. A good amount of attention is paid to poultry, and hens pay better than cows.

Newbury (G. W. ADAMS). — Indian corn is in good condition. Rowen is more than an average crop. The prospect is good for late potatoes, and there is but little blight or rot. Apples are a poor crop, pears fair, no peaches, grapes half a crop and cranberries half a crop. Pasturage is in excellent condition. Oats and barley are average crops. As a rule, little attention is paid to poultry; perhaps the proportion of income derived would be one to fifty for the dairy.

Topsfield (B. P. PIKE). — Indian corn shows heavy fodder, and if there is suitable weather for it to ear up there will be a heavy crop. Rowen was never better. Potatoes promise an excellent crop, and there is no complaint of blight or rot. Apples are not over one-third of a crop, pears fair and no peaches. Pasturage was never as good at this time of the year. The income derived

from poultry culture is about 10 per cent that derived from the dairy. Cranberries are drowned at the present time, but appear to be a good crop.

Manchester (JOHN BAKER). — Indian corn is in very good condition. The prospect is that there will be a great crop of rowen. Potatoes will be a good crop where free from rot, which is showing on low land. Apples and cranberries are good crops, grapes fair, peaches and pears poor. Pastures are in excellent condition. Each farmer keeps a few fowls.

NORFOLK COUNTY.

Stoughton (C. F. CURTIS). — Corn is a full crop where planted early, and a three-fourths crop where planted late. Rowen is the best crop ever known. Potatoes are turning out good, with but little rot. Apples are half a crop, pears half a crop, and grapes and cranberries full crops. There is plenty of feed in the pastures, owing to so much rain. Not enough attention is paid to poultry to amount to anything.

Canton (E. V. KENNEDY). — Corn is looking very thrifty, though it is a few days late and there is some smut. Rowen will be an unequalled crop. The potato crop is good and of excellent quality, but there are several reports of rot. Apples are an ordinary crop, pears and peaches small crops, grapes excellent. Pastures were never in better condition at this time of year. Oats and barley were good crops, but were badly damaged in harvesting. All farmers keep from 25 to 100 hens, but the proportional income derived from poultry is very small when compared to that from the dairy, as milk for market is the principal product of our farmers.

Foxborough (E. A. MORSE). — Indian corn is a fairly good crop. Rowen is the best for many years. The prospect is good for late potatoes, but early ones are blighted considerably. Apples are a fair crop, no peaches, grapes and cranberries good. Pasturage is in good condition. I think there is as much income derived from poultry as from the dairy in this town.

Medway (MONROE MORSE). — Indian corn is 80 per cent of a full crop. Rowen is 25 per cent above a full crop. Potatoes show a heavy growth of tops, but tubers have not set well. Apples and pears are about half crops and peaches not over one-third of a crop. Pasturage is in first-class condition. Oats and barley made a good growth, and were mostly used for fodder. Considerable poultry is kept. The great amount and continuity of rain has made it impossible to keep weeds down.

Norfolk (G. E. HOLBROOK). — Indian corn is rank in fodder,

but the ears are backward. Rowen is very good, but needs bright sunshine. Potatoes look well, with no rot or blight. Apples are about half a crop for a bearing year. Pastures were never better and all kinds of stock have gone through well. Oats blighted badly. Most of our farmers raise eggs for market, and the hen is far ahead of the cow as a source of profit.

Bellingham (J. J. O'SULLIVAN). — Indian corn is in good condition. Rowen is a good crop. There is little blight or rot on the potatoes. Apples a fair crop, pears a poor crop and other fruits good. Pasturage is in good condition for the time of year. Probably the proportion of income derived from poultry is about a tenth that derived from the dairy.

BRISTOL COUNTY.

Euston (H. M. THOMPSON). — Corn is in good condition ; fodder corn lodged badly recently, necessitating cutting in some localities before it was fully matured. The rowen crop will be a banner one. Blight is noticeable on potatoes, but the prospect for the crop is fair ; in low places they begin to show rot. Apples are a fair crop, pears good, peaches fair, grapes fair and cranberries average. Pastures are in good condition. Oats are a good crop. Poultry is quite an item, and I should estimate the income at about 50 per cent of that from the dairy. Ducks have proved very unprofitable, and many signify their intention of giving up this branch of the business.

Attleborough (ISAAC ALGER). — Indian corn is a full average crop. The rowen crop was never larger. Potatoes promise to be a fine crop. All kinds of fruit are much below the average. Pasturage is in extra good condition. Oats and barley are about average crops.

Berkley (R. H. BABBITT). — There will be a fair crop of Indian corn. Rowen will be more than an average crop. Potatoes will be a light crop, but there is neither blight nor rot. Apples, pears and peaches will be light crops ; grapes and cranberries very good. Pasturage is in very good condition. Oats and barley have been good crops. Our farmers get more money from dressed poultry and eggs than from dairy products.

Westport (A. S. SHERMAN). — Corn is in very good condition. The prospect for rowen is very good, better than for many years. Apples and peaches are scarce, pears plenty, not many cranberries. Pasturage was never in better condition. Oats and barley have not done well. Considerable attention is given to poultry, and poultry products bring about one-fourth as much income as

the dairy. Turnips are looking well, while cabbages are not doing well.

Dartmouth (L. T. DAVIS). — Indian corn is about in average condition. Rowen is in as good condition as it can be in this section. Potatoes are a good crop, but are rotting badly. Apples are a light crop, pears half a crop, no peaches and grapes half a crop. Pastures are in good condition. Oats and barley have been a good deal damaged by much rain.

Acushnet (M. S. DOUGLAS). — Indian corn is looking well. Rowen is more than an average crop. Blight has struck late potatoes and they are rotting. No apples, pears fair, some peaches, grapes good. Pasturage is in good condition. Oats and barley are not over half crops. Considerable attention is paid to poultry, and I should think the income from that source about equal to that from the dairy.

PLYMOUTH COUNTY.

Brockton (DAVIS COPELAND). — Corn is looking well, and there is a large growth of fodder. Rowen is 33 per cent above an average crop. There are not many late potatoes planted. No peaches; apples a small crop; pears and grapes fair. Pasturage is in good condition. Oats and barley are not raised for grain, but were good as forage crops.

West Bridgewater (C. T. HOWARD). — Corn has grown very rapidly the last month, and is looking well. All fields that had a good first crop will cut a heavy crop of rowen. We expect late potatoes to rot badly. All fruit promises less than an average crop. Pastures are very good this season. Nearly all our farmers have a flock of hens, and, while some make more from their hens than from the dairy, all find a good profit in the poultry yard.

Pembroke (NATHANIEL MORTON). — Indian corn is a good crop. Rowen is fully up to the average of former years. The prospect for potatoes is clouded, owing to blight and slight rot. Apples are a small crop, but cranberries promise well. Pasturage is in good condition. Poultry receives more attention than the dairy. The condition of all crops has been impaired by excessive rains.

Kingston (J. H. CUSHMAN). — There is a good show for a full crop of corn, though the high winds and hard rains have done it some damage. Rowen is more than an average crop. There is a good prospect of a full crop of potatoes; no blight or rot has appeared. Apples scarce; no peaches; pears, grapes and cranberries average crops. Pastures are holding out well since the rains. Poultry is raised mostly for family use.

Duxbury (A. M. GOULDING). — Indian corn is a full average with former years. Rowen is a larger crop than for several years. Some fields of late potatoes are badly diseased, while on others not a trace of it is to be seen. There is no fruit except grapes and cranberries, which are looking well. Pasturage is in excellent condition. Oats and barley are about average crops. The poultry business here is a specialty, the average farmer only keeping a small lot.

Muttapoisett (A. R. SWIFT). — Indian corn is in good condition. Rowen is a good crop. The prospect is good for potatoes and neither blight nor rot has appeared. Apples, pears and peaches are poor crops; grapes and cranberries fair. Pasturage is in good condition. Oats and barley are poor crops. Considerable attention is paid to poultry, and the income derived from it is about equal to that derived from the dairy.

BARNSTABLE COUNTY.

Bourne (D. D. NYE). — Indian corn is in fine condition. Rowen is as good as the average of crops, if not better. The prospect for potatoes is good, and I have noted but one case of rot. Cranberries are a fair crop; other fruits very scarce. Pastures are in fine condition. Oats and barley are very fair crops. The income from poultry is a third greater than that from the dairy.

Sandwich (J. R. HOLWAY). — Corn is in good condition. Rowen is above an average crop. Potatoes are below the average, and most pieces are blighted. There are some pears and grapes; cranberries a fair crop; apples and peaches scarce. Oats are rather a small crop. Much attention is paid to poultry, and the income derived from it is nearly double that from the dairy.

Barnstable (JOHN BURSLEY). — Indian corn is in good condition. The rowen crop is larger than for the last five years. Potatoes are a good crop, with no signs of decay and but little blight. No apples, pears very light, grapes good, cranberries a light to medium crop. Pastures are in good condition. Oats are a very light crop. Few farmers make a specialty of poultry, but nearly every one keeps a few fowls; the income from poultry and the dairy are about even.

Brewster (J. H. CLARK). — Indian corn is in very good condition. Rowen is a better crop than the average. Potatoes are turning out well, and there is no rot so far. No apples, very few pears, cranberries an average crop, very few peaches and grapes. Pastures are in excellent condition. Oats and barley are good crops. Not much attention is paid to poultry raising.

Chatham (E. Z. RYDER). — Indian corn is looking finely and

promises a good crop. The prospect for rowen is very good, owing to the late rains. The late potato crop will be good; have noticed neither blight nor rot. Apples and pears are small crops; cranberries are very good crops at present. Pasturage is in good condition. Poultry raising is not carried on to any extent by our farmers, and the proportional income derived from it is small when compared with the dairy.

Wellfleet (E. S. JACOBS). — Rowen is an unusually good crop. Potatoes promise a plentiful crop, and there is not much blight or rot. The apple crop is a small one. Pasturage is in good condition. There is more income derived from poultry than from the dairy. Grapes are quite plentiful, but are not ripening very well. Cranberries are an uncertain crop as yet. Pears are quite plenty.

NANTUCKET COUNTY.

Nantucket (C. W. GARDNER). — Indian corn is in very fine condition. Rowen bids fair to be a very heavy crop. Potatoes are rotting somewhat. There will be a fair crop of fruit. Pastures were never in better condition. Oats and barley are not up to the average. There is a great deal of poultry raised and sold here, and it pays well, though the price is down. The income derived from poultry is about two-thirds that from the dairy.

BULLETIN OF
MASSACHUSETTS BOARD OF AGRICULTURE.

TUBERCULOSIS AND THE MILK SUPPLY.

By GEORGE M. WHITAKER, M.A., *Acting Executive Officer, Massachusetts Dairy Bureau.*

During the past few years many statements have been made about possible danger from the use of milk on account of the chance of its containing disease germs. These assertions, coming from good scientific authorities, have been frequently repeated in the newspapers, which are always on the alert for what is novel or startling, and the claims have lost nothing at the hands of the sensational press. Sometimes a scientific man has stated the case in rather startling language. All this has created considerable agitation and tended to curtail the consumption of milk. At times these statements have been coupled with suggestions for removing the danger and for milk and dairy inspection, but by methods somewhat radical and arbitrary. A natural reaction from these assertions and recommendations has led, in not a few instances, to a denial of the statements of the scientific experts. Much personal animosity and bitter feeling have also been involved, and it has been difficult to treat the question calmly and candidly. The times hitherto have not seemed ripe for a judicial discussion of this topic. Possibly it can now be done in a way that will not only convey facts to the public, but also present the facts in their proper relation to other facts, and give their true bearing upon the general milk and food situation. This will furnish the public needed information, will help producers, stimulate the consumption of milk, and place the scientific bearing of the case on a solid footing and in line with good judgment.

By way of introduction, it should be stated that danger besets us on every hand during every day of our existence. The very

act of living is full of possible dangers, — in the air we breathe, the water we drink, the food we eat, and all the incidents connected with our daily lives. The germ of fever or other contagion may enter our systems through food, drink or air; the dog may go mad; the bull may gore us; the railroad train may be derailed; our horse may run away, or the wagon break; the mowing machine may upset and injure us; lightning may strike, or the engine blow up; electric wires may bring sudden death; and the grade crossing may menace our existence. Wherever we go and whatever we do, possibilities of danger to life are on every hand. The truth of this is seen not only in the experience and observation of every person, but in the news items which the daily papers bring to us each morning and evening. And yet the danger which exists exists chiefly in the aggregate. The personal chances of injury are very slight. The proportion of people injured to all of the human race is small; our individual chance of immunity from accident is large.

But there is one marked difference between the dangers from physical accident and the danger from disease germs. Surg.-Gen. Alfred H. Holt of Cambridge read a lecture before the State Board of Agriculture in Springfield in 1887. It was my duty to report that lecture, which I did by interviewing Dr. Holt at his home in Cambridge, and preparing an abstract from the manuscript in advance of its delivery. It was an explanation of the germ theory of disease, including typhoid fever, diphtheria, tuberculosis and other diseases, in which he said that this explanation of the origin of many diseases “is more a condition that has been forced upon us by the teachings of the microscope and the laboratory than a theory.” After preparing the report, I asked him how it happened, in view of the prevalence of these germs and the ever-present possibility of their getting into our systems, that there was any human race left. His explanation made a strong impression upon me at the time, and has often been recalled during the heated discussions over the possibilities of any germs being conveyed in milk. The doctor explained clearly that health is the natural condition of the human race, and that the forces of nature are working for health all of the time. The germs get in their deleterious work chiefly when nature is in some way handicapped, — by weakness or other abnormal conditions, — rendering the system favorable for their reproduction. Consequently, in the majority of cases the germs do no harm.

These dangers are so common and the individual risk so slight that we go about our daily duties without fear, maybe carelessly;

we know that even in the case of war a large majority of the persons who go to the front return alive. Even though a horrible ocean calamity, bringing hundreds to an untimely end, sends a thrill of horror through the community, the steamers next sailing are loaded with passengers, each one believing that the probabilities of a similar accident happening to him are very slight. The railroad accident, causing many deaths, does not decrease travel. In other words, these various possibilities of injury or death create no panic or scare in the community. But, on the other hand, they are not viewed with stolid indifference. They lead to extra precautions and increased safeguards.

Though the railroad accident does not cause any decrease in railroad traffic, though the public, with what appears to be almost reckless carelessness, journeys the next day as if nothing had happened, the accident does not pass unheeded. Its causes are carefully studied, the danger of a similar occurrence is investigated, and the expert mechanic in his workshop and study evolves an air brake, an interlocking switch, an automatic signal or some other safety appliance, and traffic is all the more safe as a result, but without panic. The ocean horror sets investigators to thinking, and some one devises new means of signalling, invents new processes for increasing safety in a fog, or suggests new paths for the ocean traffic. The falling of an electric wire, causing the death of a passer-by, or the crossing of an electric light wire with a telephone wire, setting fire to valuable buildings, does not decrease the use of electricity, and the dangers therefrom are not vociferously advertised, to alarm the public; but careful investigation follows, then come days and nights of study and experiment, and finally some expert electrician devises a method for insulating the wires or for operating them satisfactorily under ground; the danger disappears, while the comfort resulting from the use of these modern conveniences increases.

All this, it seems to me, teaches us a lesson as to the milk question, — the dangers from germs, the way to face the danger, its seriousness, and the course to be adopted. Within a few years wonderful advances in bacteriology have been made, and facts which ought not to be disputed, conservatively stated, are these: It has been found that many kinds of disease are caused by microscopic germs; these germs have been actually seen with powerful magnifying glasses, and identified so as to be as well known to the microscopist as is any human being to his neighbors and friends; milk has many characteristics that make it a medium to which germs can readily gain access, and by which they may be commu-

nicated to the human system; there is an abundance of authority for the assertion that, under conditions which sometimes exist, milk *may* be, and probably is, a medium for conveying tuberculosis. This cannot be denied or disproved. There is an element of danger in the use of milk.

This danger, owing to circumstances hinted at above, but which there is not space to amplify, has not been treated like the dangers incident to railroad travel or the use of electricity; but it has been popularly discussed by extremists, — those who have exaggerated the real relative danger, and those who have belittled it. The trouble with some who have discussed the possibility of germ contamination of milk is that they have lost sight of the true relative position of affairs. While with one eye they have looked through the microscope at the bacillus and seen it greatly enlarged, they have looked at remaining qualities of milk with the other eye unaided; hence they see the microscopic germ out of proportion to the rest of the world. This has caused them to tell truth, but in some instances to present it out of a proper relation to other things. In attempting to refute this error, other persons have carelessly but honestly gone to the other extreme of denying the statements of the scientific observers, declaring the whole germ theory to be a hoax and a humbug. They have pointed out the well-known fact that people have used milk in large quantities ever since history began; that the population of the world has steadily grown, and that the average life of man has been increasing; that tuberculosis is decreasing. This kind of talk has gone so far that in one case we have read of a man offering to take daily potions of milk impregnated with the bacilli of tuberculosis, as an object lesson proving their harmlessness.

I am familiar with a town through which a railroad has run for many years. One of the principal streets crosses the track at grade, and hundreds of people pass and repass every day. I have frequently crossed the rails at that point myself, without any apparent risk. But one day an omnibus with some of the most promising and best-known young men in town was being driven over the crossing. In some way the driver failed to be aware of an approaching train, which crashed into the vehicle, killing and maiming some six or eight persons. A thrill of horror ran through the community, and a prompt recognition of the danger of the crossing was on every one's tongue. Immediately it was decided that something must be done, and the corporation was compelled to station a flagman there. At that time, would an offer from me to walk to and fro over that crossing every day for a year, as

proof of its comparative harmlessness, have availed anything, or, if accepted, would it really have proved that there was no danger? Would the absence of any accident to one hundred thousand people who might cross the rails for the next ten years prove that no danger existed? In spite of the small percentage of injuries, in spite of the relatively small probability that any specified individual would meet with danger, the expense of such precautions as flagmen or gates was wisely deemed necessary.

What shall we do about the milk supply? Exactly what is done in the case of the railroad or electric wire accident. The quiet, unostentatious work of student, experimenter and producer alleviate these dangers. Even if an appeal to restrictive legislation is necessary, newspaper broadsides, illustrated with views of blood-curdling horrors, are not essential, and may even retard the good cause.

It is a fact that tuberculosis is now on the decrease, owing to more knowledge of it and how it should be controlled. In Boston, from 1846 to 1865, the number of annual deaths from consumption per 1,000 of population ranged from 40 to 48. From 1886 to 1896 they had declined to from 25 to 40. The average from 1891 to 1896 was 29, against 47, the average from 1851 to 1855. But the fact remains that tuberculosis is still the most fatal disease among us. It kills its hundreds where other well-known diseases kill their tens; and the fact that it is decreasing should not preclude still further efforts along the line of precaution and prevention.

We desire to urge with emphasis that there is truth in both sides of the contentions of the last few years. But we believe that, with all that can be said against it, milk is relatively one of the most healthful foods there is, a great boon to the human race, and a food product which should be consumed in much larger quantities than at present. We believe that, especially in the large cities, more people suffer from the want of it than from its use. At the same time, there is an element of danger in it, just as there is an element of danger in grade crossings, in exposed electric wires and thousands of other things. Science is making progress in showing us how to reduce these dangers. It has been put to practical account in surgery, and the deaths from surgical operations have been thereby wonderfully reduced during the past few years. The studious investigators and the intelligent producers of milk should work together, each counteracting any tendency of the other to excess, and thus bringing about true and healthy progress. There should be a hearty co-operation between conservative scientists and

enterprising producers. The scientist should tell the truth, carefully and calmly, and in the correct perspective, with needed explanations and qualifications. The producer ought to have a receptive mind, eager to learn, and anxious to take every reasonable precaution to produce a harmless product. The lives of weak infants or debilitated invalids may be in his keeping. He should realize the full extent of his responsibility.

A gentleman once said to me that he considered the charges about the possible dangers from milk as wholly false, and a scare got up by selfish men for selfish purposes. My reply was an illustration from my own family. One member, perfectly healthy in every way, so far as could be ascertained, drank milk freely and with impunity, without thought or care of the result. Another, in feeble health, the object of much solicitude, was not allowed to drink milk until it had been carefully boiled, to kill any possible germs of tuberculosis. After narrating the case, my sceptical critic replied that he would have done the same thing in his own family, under similar circumstances. In that admission he gave away his whole case. Health is the natural condition of mankind, and when nature is given fair play she will do much to counteract any small lapses from obeying her laws. We admit that a person in rugged health might under favorable conditions take germs of tuberculosis into his system with impunity, for the kindly functions of nature in the digestive processes and elsewhere might eliminate these from the system, and no ill effects would result. But in the case of debilitated, sickly or weak persons, the conditions are different, and danger may exist; not in any emphatic way, to cause alarm or panic, but enough to cause prudence and care. Let an alarm of fire be given in a crowded theatre, and a panic ensues; usually the danger in the panic by the horrified people crowding against and trampling upon one another is much greater than the danger from fire. We must face the milk question with every effort to avoid panic, but honestly realizing the truth. As the world advances and popular intelligence increases, more and more care will be taken in the milk supply, more and more confidence will be felt in it by the consuming public, and, as a result, larger and larger quantities will be consumed. Progress will help both consumer and producer.

MASSACHUSETTS
CROP REPORT

FOR THE

MONTH OF SEPTEMBER, 1898.

ISSUED BY

WM. R. SESSIONS,

SECRETARY STATE BOARD OF AGRICULTURE.

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CROP REPORT FOR THE MONTH OF SEPTEMBER, 1898.

OFFICE OF STATE BOARD OF AGRICULTURE,
BOSTON, MASS., Oct. 1, 1898.

Bulletin No. 5, Crop Report for the month of September, is herewith presented. We desire to call the particular attention of our readers to the article on "Milk and Cream," by J. B. Lindsey, Ph.D., chemist Department of Foods and Feeding, Hatch Experiment Station of the Massachusetts Agricultural College.

PROGRESS OF THE SEASON.

The September returns of the United States Department of Agriculture (Crop Circular for September, 1897) give the condition of corn on September 1 as 84.1. This is 2.9 points lower than last month, 4.8 points higher than on Sept. 1, 1897, 6.9 points lower than on Sept. 1, 1896, and eight-tenths of a point above the mean of the September averages of the last ten years.

The average condition of wheat when harvested was 86.7, or 1 point higher than was reported on Sept. 1, 1897, 12.1 points higher than at the corresponding date in 1896, and 5.1 points above the mean of the September averages of the last ten years.

The average condition of the oat crop when harvested was 79, against 84.6 reported Sept. 1, 1897, 74 at the corresponding period in 1896, and the September mean of 80.8 for the last ten years.

The average condition of barley was 79.2, as compared with 86.4 reported Sept. 1, 1897, 83.1 at the corresponding period in 1896, and the September mean for the last ten years of 84.8. The low average condition is due to the failure of the crop in California, which is the principal barley-producing State of the country.

The average condition of rye was 89.4, against 90.1 reported September 1, 1897, 82 at the corresponding period of 1896, and the September mean for the last ten years of 87.8.

The average condition of buckwheat was 88.8. as compared with 95.1 reported Sept. 1, 1897, 93.2 at the corresponding period in 1896, and the September mean for the last ten years of 87.7.

The average condition of cotton was 79.8, a decline of 11.4 points during the month. The condition on Sept. 1, 1897, was 78.3, and at the corresponding date in 1896, 64.2, while the mean of the September averages of the last ten years is 79.4, or within four-tenths of one point of the condition on the first of the present month.

No average condition for the entire country can be established for tobacco, but nearly all the important tobacco-growing States report from 89 per cent to 98 per cent of a full crop.

The average condition of Irish potatoes was 77.7. This shows a decline of 6.2 points during August, but the condition is still 11 points above that reported on Sept. 1, 1897, and is only seven-tenths of a point below the mean of the September averages for the last ten years.

The reports as to sweet potatoes are not such as to warrant the establishment of an average condition for the entire country, but, on the whole, the very favorable condition reported last month is fully maintained.

It is manifest from the reports that have been received that the acreage devoted to clover seed is less than it was last year, and that the condition is, in the main, unfavorable.

The sugar cane reports are exceptionally favorable, that of Louisiana, in particular, being 2 per cent above a full crop.

The rice crop also promises to be much above the average, Louisiana, the principal rice-producing State, leading off with a condition of 101.

There is, in general, a continued downward movement in the condition of the apple crop, only the States of Georgia, Iowa, Minnesota and Idaho reporting the slightest improvement over the August report.

Taking the States in which peaches are a commercial crop, together with those in which the production is small, or not more than sufficient for the local demand, there is probably about two-thirds of a full crop. Georgia, the principal peach-producing State in the Union, reports a condition of 108.

The condition of the grape crop is in the main very satisfactory. If no exceptionally favorable conditions are reported from the States that furnish the main supply of the country, on the other hand, there are no notably unfavorable conditions.

The number of hogs for fattening shows a decrease of 6.5 per cent from that of last year. As regards condition, the reports are in the main very favorable, the general average being 96.1, as compared with 93.5 on Sept. 1, 1897, 94.5 at the corresponding date in 1896, and 94.3 the mean of the September averages of the last ten years.

In Massachusetts the average condition of corn September 1 is given as 97; the average condition of rye when harvested as 97; the average condition of oats when harvested as 88; the average condition of barley when harvested as 91; the average condition of buckwheat as 98; the average condition of potatoes as 86; the average condition of apples as 56; the average condition of peaches as 48; the average condition of grapes as 79; the average condition of tobacco as 103; the number of stock hogs compared with last year as 97, and their average condition as to size and weight as 99.

TEMPERATURE AND RAINFALL FOR THE WHOLE COUNTRY.

[FROM UNITED STATES CLIMATE AND CROP BULLETINS.]

Week ending August 29. — The week was warmer than usual throughout the country, with the exception of small areas in the east Gulf States, upper Lake region, central California and southwest Arizona, where it was slightly cooler than usual. The maximum temperatures of the week were generally slightly higher than usual throughout the central portions of the country, in the Rocky Mountain region and in the North Pacific States. No unusually low minimum temperatures were recorded. More than the usual

amount of rain fell over the greater part of the south Atlantic and east Gulf States, over northern and eastern Texas, in the Lake region, northern New England, and over portions of the Ohio, upper Mississippi and lower Missouri valleys. The week was drier than usual in the middle Atlantic States, northern portion of the south Atlantic States and in the lower Mississippi and upper Missouri valleys. Elsewhere throughout the country very little rain fell. The week was, generally speaking, favorable for corn, unfavorable for cotton and favorable for tobacco.

Week ending September 5. — The week was warmer than usual in all districts east of the Rocky Mountains, except in extreme southern Florida, western North Dakota and eastern Montana, where it was slightly cooler, and throughout the central and northern districts the week was exceptionally warm. The week was cooler than usual on the Pacific coast and in the plateau regions. Very heavy rains fell in Tennessee, the south Atlantic and portions of the east Gulf States. There was more than the usual amount over portions of the Lake region and central valleys, and over the northern and central plateau regions. The week was drier than usual in New England and the middle Atlantic States, over the Florida peninsula, generally throughout the central and lower Mississippi valleys, over the eastern Rocky Mountain slope, northern portion of the Lake region and in the upper Ohio valley. Corn made rapid progress towards maturity. Cotton suffered seriously from rust, shedding and insects over the eastern portion of the cotton belt. Most of the early tobacco was cut and housed under favorable conditions and the late crop, was generally, promising.

Week ending September 12. — The week was from 1° to 4° per day warmer than usual in New England, while along the middle Atlantic coast nearly normal conditions prevailed. It was also warmer than usual in the Pacific coast States, except near the central Californian coast. The week was cooler than usual from the Rocky Mountain plateau region eastward to the lower Lake region and South Atlantic coast, the deficiency from the Rocky Mountain region eastward to the upper Mississippi valley being quite marked. Excessive rains fell in Arkansas and Kansas, and in portions of Ne-

braska, Iowa and Missouri. There was also more than the usual amount over portions of the middle and south Atlantic States, Kentucky, Illinois and the lower Lake region. The week was drier than usual over New England, the greater portion of the middle Atlantic States, Ohio Valley, Gulf States and throughout the upper Lake region. No rain fell from the Rocky Mountain plateau region westward to the Pacific coast. Early corn was much of it secured and late corn did well. Cotton did not improve materially. The bulk of the tobacco crop was secured in generally excellent condition.

Week ending September 19. — The week was warmer than usual generally throughout the Rocky Mountain and Pacific coast regions, over the central and northern districts from the upper Missouri valley eastward to the New England and middle Atlantic States, and over the greater portion of the west Gulf States. It was decidedly warm over the middle and northern plateau districts and in the regions of the great Lakes. The week was cooler than usual over the middle and southern Rocky Mountain slopes, where freezing temperatures occurred, and in the eastern portions of Kansas, Nebraska, and western Arkansas. The week was practically rainless over the Rocky Mountain and Pacific coast regions, and from the east Gulf States northward to eastern Pennsylvania, and there was less than the usual rainfall over the greater part of the Lake region, upper Mississippi valley and west Gulf States. There was more than the usual amount of rain in the lower Ohio, central Mississippi, lower Missouri and Red River valleys, and over areas in the Lake region and Texas. The weather conditions were favorable for late corn, there was a slight improvement in cotton, and late tobacco did well.

Week ending September 26. — The week was warmer than usual throughout the country, with the exception of northern New England and portions of California, where it was slightly cooler than usual. From the northern and middle Rocky Mountain regions eastward over the central valleys, including the South Atlantic States, the week was decidedly warm, the average daily temperature excess ranging from 6° to 10°. The crop season closes with the temperature decid-

edly in excess of the average from the Missouri valley eastward to the Atlantic coast north of the Carolinas, including the northern portion of the Gulf States. There was more than the usual amount of rain generally throughout the Mississippi valley, and also in the Ohio valley, Lake region and middle Atlantic coast from southern New England to North Carolina. There was a total absence of rain in the central and southern plateau regions, extreme southern California, and generally throughout the eastern Rocky Mountain slope. The week was one of exceptionally favorable temperature conditions for the maturing of crops generally throughout the country.

SPECIAL TELEGRAPHIC REPORTS.

[WEATHER BUREAU, BOSTON.]

Week ending August 29. — New England. Boston : Warm weather ; copious showers prevailed till 25th, followed by fair, cool ; growing crops and all vegetation in excellent condition ; warm, dry weather needed to mature potatoes, tobacco, corn and cranberries.

Week ending September 5. — New England. Boston : Weather has been favorable to crops and farm work ; rain needed, wells and streams in Maine low ; pastures drying ; ploughing and fall seeding in progress ; potatoes and tobacco secure ; corn still subject to injury from frost.

Week ending September 12. — New England. Boston : Warm and sultry, ending in local storms Wednesday, followed by cool, dry weather remainder of week ; light to killing frosts mostly in northern sections 10th, 11th and 12th, damage not great ; cranberries and some corn subject to damage from heavy frosts ; rain is much needed in Maine ; soil is too dry to plough.

Week ending September 19. — New England. Boston : Weather favored farm work, which progressed rapidly ; crops generally secured ; killing frosts in northern and light frosts in southern sections 12th and 13th, damage not great ; rain much needed in Maine, where pastures are drying, streams failing and soil too dry for ploughing and seeding ; getting dry in Vermont and New Hampshire.

Week ending September 26. — New England. Boston : Weather generally favorable, copious rains relieved drought ; fields in excellent condition ; plowing for fall seeding in rapid progress ; harvesting nearly completed ; apples light ; potatoes average ; corn and hay large crop.

SEPTEMBER WEATHER.

One of the longest and most sustained warm weather periods on record prevailed throughout Massachusetts and the other north-eastern States during the first seven days of the month. The temperature did not attain any remarkably high figures during that time, but, after hot days, the nights were warm and oppressive, and the average daily humidity was considerably above the normal. On several of these days showers and thunder-storms occurred, but no cooling conditions arrived until the 8th, when fresh north-west winds lessened the moisture in the atmosphere and lowered the temperature. These pleasant days continued until the 17th, when a low area of barometer passing north of us brought warm, moist weather ; this, however, was of short duration, and the attending thunder-storms were followed by lower temperature which culminated in light frosts on the mornings of the 21st and 22d. The frosts were not damaging except in exposed localities, and then only to a very limited extent. Gloomy weather with easterly winds and temperature considerably below normal was prevalent on the 24th and 25th, the temperature falling from about 80° to 45° in twenty hours. The closing days of the month were warmer and altogether more propitious. No heavy gales were noted during the month and the prevailing winds were from westerly quarters. Altogether, September was extremely favorable for harvesting.

In the circular to correspondents returnable September 23 the following questions were asked : —

1. How does Indian corn compare with an average crop?
2. Are rowen and fall feed up to the usual average?
3. Has the average amount of fall seeding been done, and what is its present condition?

4. How does the onion crop compare with an average crop?

5. Are potatoes an average crop in yield and quality?

6. What is the prospect for root crops, celery and other late market-garden crops?

7. How have apples, pears, peaches, plums, grapes and cranberries turned out?

Returns were received from 175 correspondents, from which the following summary has been made :—

INDIAN CORN.

The warm, dry weather of the early part of the month brought corn forward very rapidly, and the absence of killing frosts enabled it to ripen up well where late. It is now a good average crop in almost all localities. There are some complaints that it has not eared out as well as usual, but these are the exception. The stover is everywhere reported as luxuriant and promises to be of good nutritive value.

ROWEN AND FALL FEED.

The rowen crop exceeded even the phenomenal crop of last year. It is frequently spoken of as the best crop ever cut and several correspondents report the cutting of three crops of hay this season. Fall feed is also in prime condition in most sections. The only exception to these conditions is on Cape Cod, where drought has prevailed and has cut short both the rowen crop and fall feed. Grass roots are generally in good condition, and pastures and mowings should start out well next season.

FALL SEEDING.

Less than the usual amount of fall seeding has been done, usually because of the ground being too moist. That which had been put in was almost universally reported as being in fine condition. With good weather enough will probably be done in early October to bring the total amount nearly up to the usual average.

ONIONS.

Onions are rather less than an average crop, taking the State as a whole. There is a marked shortage in the regions of principal production, due principally to blight. There is also complaint that the bulbs are smaller than usual, and that the onions do not weigh up as much as they look.

POTATOES.

Potatoes will not be an average crop and there are many complaints of rot. The crop is generally uneven, some fields yielding well and being free from rot, while others near by rot very badly. There are also many complaints that the tubers are small and few in the hill. Generally speaking the promise of a month ago as to yield has not been fulfilled, there being a falling off in condition during the month. Aside from rot the quality of the crop is generally good.

ROOT CROPS, CELERY, ETC.

Root crops are now in good condition and good yields are generally promised. There are not a great many reports as to celery, but judging from such as came to hand, the crop will hardly be a full one. There is also some complaint of rust. Other late market-garden crops are doing well and promise good yields.

FRUITS.

Apples are very uneven, but the crop is probably better than was anticipated in most sections. It is nevertheless far from an average crop for a bearing year. Pears generally yielded well. Peaches did better than usual and brought good prices. Plums rotted badly, but where sound yielded well. Grapes generally show good yields, but are still on the vines in many cases and in danger of injury from frost. Cranberries were hardly an average crop, but still did better than was expected a month ago. They are generally of good quality and but little injury from frost was reported.

NOTES OF CORRESPONDENTS.

(Returned to us September 23.)

BERKSHIRE COUNTY.

Egremont (J. H. ROWLEY). — Indian corn compares favorably with an average crop. Rowen and fall feed are up to the usual average. There has been but little fall seeding done as yet owing to the large amount of rain. Onions are small but yield well. Potatoes are an average crop as to yield and quality. The prospect for root crops, celery and other late market-garden crops is good. Apples are a better crop than was anticipated earlier in the season.

Monterey (WM. S. BIDWELL). — Indian corn is more than an average crop. Rowen and fall feed are in better condition than usual. There has been but very little fall seeding done. Potatoes are a better crop than for the past two seasons. The prospect is good for root crops, celery and other late market-garden crops. Apples seem to be a good crop with us this year; other fruits scarce.

Becket (WM. H. SNOW). — Indian corn has suffered no damage from frost as yet and the probabilities are that it will ripen up in good shape. Rowen and fall feed are fully up to the average. The usual amount of fall seeding has been done and is in good condition. Potatoes are not quite up to the average and are rotting badly where they yielded well. The prospect is good for root crops, celery and other late market-garden crops. Apples are a small crop, pears few, cranberries a fair crop, but not much raised.

Lee (ALONZO BRADLEY). — Indian corn is a full average crop. Rowen and fall feed are in first-class condition. Potatoes are about three-fourths of an average crop. Apples are 40 per cent of a full crop, pears 90 per cent and grapes 40 per cent.

West Stockbridge (WM. C. SPAULDING). — Indian corn is a very good crop and is above the average. Rowen and fall feed are in better condition than usual. Fall seeding is now going on and probably the usual amount will be done. Onions are raised only as a garden crop. Potatoes are medium in quantity, size not quite up to the average, quality excellent. The prospect is good for root crops, celery and other late market-garden crops. Fruits of all kinds show medium crops.

Washington (E. H. EAMES). — Indian corn is more than an average crop. Rowen is a much better crop than last year. Not very much fall seeding has been done as yet. I find that where no phosphate was used for potatoes they did not rot, but where it was used they are a total failure. Root crops, celery and other late garden crops are only raised for home use. Apples are about half a crop.

Windsor (H. A. FORD). — Indian corn is a full average crop. Rowen and fall feed are up to the usual average. Not much fall seeding has been done as yet. Onions are a full average crop. Potatoes are up to the average in yield, but are rotting very badly. Apples are very uneven, some orchards being very full while others have but little fruit.

Cheshire (L. J. NORTHROP).—Indian corn is more than an average crop. Rowen and fall feed never looked better in my recollection. Some fall seeding has been done and is looking well. Potatoes are a little off from the average but are of a good quality. Root crops are not as good as usual as a general thing and some fields are a failure. Apples are forty per cent off from a full crop, pears plenty.

New Ashford (ELIHU INGRAHAM).—Indian corn is more than an average crop. Rowen and fall feed are better than usual. The usual amount of fall seeding has been done and is looking finely. Onions are an average crop. Potatoes are a light crop of good quality. The prospect is good for root crops, celery and other late market-garden crops. Fruits of all kinds have yielded very poorly.

FRANKLIN COUNTY.

Monroe (D. H. SHERMAN).—Indian corn is fully up to an average crop. Rowen and fall feed are away ahead of the usual condition. No fall seeding is done in this section. Potatoes are an average crop in yield and quality, but some fields are rotting badly. Turnips are looking well. Apples are perhaps sixty per cent of an average crop.

Heath (O. D. CANEDY).—Indian corn is better than an average crop. Rowen and fall feed are the best I have seen for years. The usual amount of fall seeding has been done and is looking well. Onions are a fair crop. Potatoes are not up to an average crop. The prospect is fair for root crops, celery and other late market-garden crops. Apples are a fine crop.

Leyden (U. T. DARLING).—Indian corn is fully up to an average crop. Rowen and fall feed are better than usual. The usual amount of fall seeding has been done and it is looking well. Potatoes are an average crop of good quality, but are rotting badly in some localities. But little attention is paid to root crops, celery, and other late market-garden crops. Apples a light crop, pears average, peaches light, no plums, grapes a fair crop.

Shelburne (G. E. TAYLOR).—Corn is not more than three-fourths of an average crop. Rowen and fall feed are ten per cent above the usual average. The usual amount of fall seeding has been done and it caught finely and never looked better. Potatoes are reported to be below an average crop and are rotting. Pears, peaches and plums are short crops and apples are below the average.

Ashfield (CHAS. HOWES).—Indian corn is a full average crop. Rowen and fall feed are above the usual average. The usual amount of fall seeding has been done and it is looking finely. Potatoes are yielding fairly well and are of good quality, but in some sections are rotting badly. The prospect for root crops and celery is good. There is an average crop of apples in this town and they are of excellent quality; other fruits about average crops.

Leverett (W. L. BOUTWELL).—Indian corn is less than an average crop. Rowen and fall feed are much above the usual average. The usual amount of fall seeding has been done and it is in good condition. Onions are more than an average crop. Potatoes are not an average crop and many fields blighted; quality good. The prospect is very good for root crops, celery and other late market-garden crops. Apples, peaches and grapes small crops; pears and cranberries good.

Montague (C. S. RAYMOND).—Indian corn is an average crop. Rowen and fall feed are the best known for years. Rather less than the usual amount of fall seeding has been done, but it is in good condition. Onions are a good crop. Potatoes are an average crop both in yield and quality. Apples, and in fact all kinds of fruit, are a light crop.

New Salem (DANIEL BALLARD).—Indian corn is somewhat above an average crop. There is a heavy crop of rowen and fall feed is good.

But little fall seeding has been done but what there is looks well. Potatoes appear to be about an average crop in yield and quality. Root crops are looking well and celery has made a fine growth this year. The apple crop is not heavy; but few pears, peaches and plums; grapes about an average; cranberries light.

Orange (ANSEL HARRINGTON).—Corn will be a full average crop except some pieces which were badly damaged by the wind. The rowen crop is the heaviest ever known and fall feed is excellent. Very little fall seeding has been done as yet. Onions are about an average crop. Potatoes are a light crop but the quality is very good. Fruit of all kinds is hardly up to the average.

HAMPSHIRE COUNTY.

Greenwich (WM. S. DOUGLAS).—Indian corn is quite an average crop. Rowen and fall feed are up to the usual average. The usual amount of fall seeding has been done and it is in good condition. Potatoes are not a full crop but are of good quality. The crop of fruit will not be very full and apples have fallen off in condition since last month.

Pelham (J. L. BREWER).—Corn is irregular in ripening but is above the average in yield. Rowen and fall feed are looking well. More than the usual amount of fall seeding has been done and it is looking well. Onions are more than an average crop. Potatoes are not up to the average in yield and quality. The prospect for root crops, celery and other late market-garden crops is encouraging. Apples have fallen badly, pears are poor in quality, peaches few, grapes and cranberries plentiful and of fine quality. The unseasonable cold of last spring had a far-reaching and baneful effect on fruit.

Amherst (H. A. PARSONS).—Indian corn compares well with an average crop. Rowen and fall feed are in good condition. The average amount of fall seeding has been done and is looking well. Onions are about half a crop. Potatoes are nearly an average crop. The prospect is good for root crops, celery, and other late market-garden crops. Apples, pears, peaches, plums and grapes are small crops.

Granby (W. S. CLARK).—Indian corn is rather better than an average crop. Rowen and fall feed are above the usual condition at this time. The usual amount of fall seeding has been done and it is looking well. Potatoes are about half a crop as to yield and of very good quality. The prospect is good for root crops, celery, and other late market-garden crops. Fruits are short crops and of poor quality.

Northampton (D. A. HORTON).—Indian corn is in very good condition and should give a crop one-fourth greater than the average. Rowen and fall feed are better than for years. The usual amount of fall seeding has been done. Onions are about an average crop and of excellent quality. Potatoes are not up to the average in yield and quality. The prospect is good for root crops, celery and other late market-garden crops. Apples are below the normal crop, but the yield seems to be good in some places.

Hatfield (THADDEUS GRAVES).—Indian corn is rather about the usual average. Rowen and fall feed are in good condition. Not so much fall seeding has been done as usual, but it is doing well. The onion crop is off owing to the blast. Potatoes are about half a crop of fair quality. Root crops, celery and other late market-garden crops are all doing well. There is a short crop in all kinds of fruit. Tobacco made a good growth and is curing well.

Chesterfield (HORATIO BISBEE).—Indian corn is an average crop. Fall feed is fully up to the average and rowen was never better. There has not been as much fall seeding done as some years. Potatoes are not an average crop. Root crops, celery and other late market-garden

crops are not much raised. Apples are not a full crop, but are better than in some sections; other fruits not much raised. With a large crop of hay and rowen and a good growth of corn fodder farmers have a large amount of winter feed.

Middlefield (J. T. BRYAN).—Indian corn is fully an average crop. Rowen and fall feed are up to the usual average. The usual amount of fall seeding has been done and it is in good condition. Onions are but little raised but are a good crop. Potatoes are of good quality but there is much complaint of rot. The prospect is good for root crops, celery and other late market-garden crops. Apples are not abundant, but small fruits have yielded well.

HAMPDEN COUNTY.

Chester (P. M. ADZIMA).—Indian corn is not more than an average crop. Rowen and fall feed are up to the usual average. About the usual amount of fall seeding has been done and the outlook is very good. Potatoes are an average crop in yield and quality. The prospect is good for root crops, celery and other late market-garden crops. There is a very good crop of all kinds of fruit.

Blandford (E. W. BOISE).—Indian corn is 10 per cent above an average crop. Rowen and fall feed are very heavy, fully 25 per cent above the average. Very little fall seeding has been done and its condition is only fair. Potatoes are less than an average crop. Garden crops good, Swedes extra good crop, English turnips rank growth of tops but light roots, next month if favorable may give a fair crop. Apples are nearly an average crop as are also pears.

Tolland (E. M. MOORE).—Indian corn, though a little late, has eared well and is a full average crop. Rowen and fall feed are above the usual average. Considerable fall seeding has been done and is looking well though it needs rain to give it a better start. Potatoes are a good average crop though some complain of rot. The prospect is favorable for a good root crop. Apples, peaches and plums are almost a failure; pears and cranberries have turned out fairly well.

Southwick (L. A. FOWLER).—Indian corn is a good crop. Rowen and fall feed are quite up to the usual average. The usual amount of fall seeding has been done and it is in good condition. Onions are a good crop. In a few localities the yield of potatoes is good, but as a rule the crop is not up to the average. The prospect is good for root crops, celery and other late market-garden crops. Apples are half a crop; pears, peaches, grapes and plums full crops.

West Springfield (T. A. ROGERS).—Indian corn is about an average crop, though perhaps a little under. Rowen is above an average crop and fall feed is in good condition. The usual amount of fall seeding has been, or will be, done; most of it has been done so recently that it does not show up particularly as yet. Some fields of onions are extra and others are small from blight. Potatoes are not up to the average in either yield or quality. Some pieces of root crops are extra, others very poor; some fields of celery ruined by the recent hot week; pole beans are not doing well. All kinds of fruit show far less than average crops.

Agawam (R. DEWITT).—Indian corn is a fair crop but a little below the average. Rowen and fall feed are in better condition than usual. Not much fall seeding has been done as yet, it is usually done after potatoes and tobacco and they have been slow in maturing. Potatoes are rather below the usual average. Apples and pears are a small crop and grapes are a fair crop.

Hampden (J. N. ISHAM).—Indian corn is better than an average crop and there are no poor fields. Rowen is extra heavy and fall feed is

green and good. A small amount of fall seeding has been done and is in good condition. Onions are less than an average crop and are small in size. Potatoes are a good average crop although many report small yields. Root crops, cabbage and other late market-garden crops are making a fine showing. Winter apples are generally a light crop, plums and grapes also light. Peaches are taking on quite a boom from the fact that the young orchard of Ethelbert Bliss, just over the line in Wilbraham, is yielding between 2,000 and 3,000 baskets, which sell readily at from \$1 to \$1.50 a basket. No wonder we all want a peach orchard, but he has a favorable location and gives his trees good care.

Brimfield (GEO. M. HITCHCOCK).—Indian corn is a fair crop, but not as good as was promised in July. Rowen and fall feed are more than average in condition. About the usual amount of fall seeding has been done and it is looking well. Potatoes are an average crop with but little rot. Apples and pears are plenty,

Holland (FRANCIS WIGHT).—Indian corn is fully up to the average. Rowen and fall feed are in better condition than usual. There has not been much fall seeding done, but that which is in is in fair condition. Onions will be about an average crop. Potatoes are about average as to both yield and quality. Root crops promise well. Apples, pears and grapes have done well; cranberries a light crop; no peaches; plums light.

WORCESTER COUNTY.

Warren (W. E. PATRICK).—Indian corn is 105 when compared with an average crop. The rowen crop is larger than for many years and fall feed is excellent. Less than the usual amount of fall seeding has been done but it is in good condition. Yield of potatoes medium, quality good, much complaint of rot. The prospect is good for root crops. There are fair crops of apples, pears and grapes, all of excellent quality.

Brookfield (F. E. PROUTY).—Indian corn will be more than an average crop. Rowen and fall feed are fully up to the usual average. The usual amount of fall seeding has been done and it is in good condition. Onions are but little raised. Potatoes are hardly an average crop. Apples are a fair crop, but not equal to two years ago; pears are a small crop; grapes a good crop; and cranberries were all killed by high water.

Spencer (H. H. KINGSBURY).—Corn is somewhat backward in ripening owing to a cold May and a cloudy summer. Rowen and fall feed are more abundant than usual. No fall seeding has been done long enough to show any growth, but the weather has been favorable for its germination. Potatoes have rotted considerably and suffered from the June drought, hence they are below the average in yield. All kinds of root crops are thrifty and abundant. The different kinds of fruits are not generally plentiful and Baldwin apples are notably scarce.

New Braintree (C. D. SAGE).—Indian corn is a fair average crop. Rowen and fall feed are very much better than usual. Very little fall seeding has been done, but that in is looking well. The yield of potatoes is fair where they have not rotted, but there is much complaint of rot. Apples appear about half a crop, pears half a crop, very few peaches and plums, grapes not ripening well. There is a brisk demand for apples at from \$1.20 to \$1.70 per barrel and farmers are generally selling.

Oakham (JESSE ALLEN).—Indian corn is a full average crop. Rowen and fall feed are up to the usual average. The usual amount of fall seeding has been done and it is in good condition. Potatoes are about a two-thirds crop of excellent quality. There is a small crop of all kinds of fruit.

Barre (J. L. SMITH).—Indian corn is better than an average crop. Rowen and fall feed are extra good. The usual amount of fall seeding

has been done and it is looking well. Potatoes are not quite an average crop in yield, but the quality is good. Apples have turned out 25 per cent better than was expected two months ago.

Dana (E. A. ALBEE).—Indian corn is a full average crop. Rowen and fall feed are a good average but are not up to last year. About the usual amount of fall seeding has been done. Potatoes are not more than half a crop. There will be a good crop of roots, celery and other late market-garden crops. Apples are not over half a crop, few pears, no peaches, grapes large crop, very few cranberries.

Winchendon (W. H. SAWYER).—Indian corn is an average crop. Rowen and fall feed are 5 per cent above the average in condition. The usual amount of fall seeding has been done and is in good condition. Potatoes are an average crop in yield and quality, but some of the fields are rotting badly and some that show no rot when dug develop soft rot after lying a day or two. There will be a fair crop of fruit.

Ashburnham (ALBERT NEEDHAM).—Indian corn is rather more than an average crop. There is considerable more rowen than usual and some of it will be fed instead of being cut owing to lack of room. The usual amount of fall seeding has been, or is being, done. Potatoes made a light yield, many fields being small and few in the hill, but the quality is generally good. Winter apples are looking finely, pears a light crop, other fruits but little grown.

Gardner (A. F. JOHNSON).—Indian corn is an average crop. Rowen and fall feed have done better than usual. An average amount of fall seeding has been done and it is in good condition. Potatoes are not up to the average in either yield or quality. There will be a good crop of all kinds of roots. Apples are three-fourths of a normal crop, pears one-fourth.

Lancaster (S. C. DAMON).—Corn is good and is mostly cut though it was late in ripening. Rowen and fall feed are more than average crops. The usual amount of fall seeding has been done. Onions are a full crop. Potatoes are an average crop in yield and quality. Root crops are less grown than usual, but what there are look well. Apples are a three-fourths crop, pears half a crop, peaches a failure, plums below the average, grapes almost a failure.

Holden (GEO. S. GRAHAM).—Indian corn is an average crop or more. Rowen and fall feed are more than average in condition. The usual amount of fall seeding has been done, but it is too early to tell much about its condition. Potatoes are not an average yield but are of good quality. The prospect for root crops, celery and other late market-garden crops is very good. Apples are about a two-thirds crop, pears the same, grapes good, peaches and plums scarce.

Worcester (H. R. KINNEY).—Indian corn promises to be fully an average crop. Rowen and fall feed are up to the usual average, but are not as heavy as last year. About the usual amount of fall seeding has been done and it is making a good start. Potatoes are a light yield but of good quality. Root crops are doing well, but celery has blighted badly. There is not much of a crop of apples and the quality is poor; pears light, no peaches to speak of, plums only a light crop, and grapes have been damaged by the hot, wet weather.

Westborough (B. W. HERO).—Indian corn is an average crop. There is an extra large crop of rowen and fall feed never was better. About the usual amount of fall seeding has been done. Onions are but little grown but are of extra quality. Potatoes are an average crop in yield and quality. Root crops promise well and there is a very large crop of squashes. Apples one-fourth of a crop, pears half a crop, peaches a total failure, plums about half a crop owing to rot, grapes and cranberries average crops.

Southborough (E. F. COLLINS).—Indian corn is a fair average crop. Rowen is a great crop and fall feed is in first-class condition. The

usual amount of fall seeding has been done and is in excellent condition. Potatoes are about an average crop. Apples are about half a crop of good quality; no peaches.

Upton (B. A. JOURDAN).—Indian corn is a very good crop. There is a large crop of rowen and fall feed is also in good condition. The usual amount of fall seeding has been done and is looking finely. Onions are a good average crop. Potatoes are average in yield and of fine quality. The prospect for root crops, celery and other late market-garden crops is very good. Apples a light crop, pears and grapes plenty, cranberries a fair crop.

Hopedale (DELANO PATRICK).—Indian corn is a full average crop. Rowen and fall feed are much above the usual average. Less than the usual amount of fall seeding has been done as yet. Onions are an uncommonly good crop. Potatoes are not a large yield, but are of good quality. The prospect is good for root crops, celery and other late market-garden crops. All kinds of fruits are less than average crops.

Douglas (J. M. RAWSON).—Indian corn is up to the usual average. Rowen and fall feed are the best for many years. Less than the usual amount of fall seeding has been done, but it is in good condition. Onions are not a good crop and maggots are doing much damage. Potatoes are an average crop in yield and quality. Celery poor, cabbage good, turnips light, carrots good. Early apples a poor crop, winter apples dropped badly, pears light, no peaches, plums rotted, grapes light.

Uxbridge (AUGUSTUS STORY).—Indian corn is a good crop though high winds and heavy rains have done some damage. Rowen and fall feed have done better than usual. We are late on fall seeding but such as has been done is looking finely. Onions are a good crop but not much grown. Potatoes are a better crop than was thought possible a month ago. The prospect is good for root crops; celery is doing well, but squashes are not up to the average. Apples, pears, peaches and plums are light crops; grapes plenty.

MIDDLESEX COUNTY.

Framingham (H. S. WHITTEMORE).—Indian corn is more than an average crop. Rowen and fall feed were never as heavy as this season. Not as much fall seeding as usual has been done. Onions are about a three-fourths crop. Potatoes are not an average crop but the quality is generally good. Squashes and celery are good crops. Late market-garden crops are generally good but bring low prices at market. Apples are three-fourths of a crop, very few peaches, plums light crop, grapes scarce and do not ripen well, half a crop of cranberries.

Marlborough (E. D. HOWE).—Indian corn is a full average crop. Rowen and fall feed are above the usual average; some fields have been mowed three times this year. But little fall seeding has been done. Potatoes are an average crop in yield and quality. Root crops, celery and other late market-garden crops promise well. Apples are three-fourths of a crop, pears half a crop, peaches 10 per cent, grapes a full crop. Apples are of such good size that the number of barrels will be larger than was anticipated.

Stow (G. W. BRADLEY).—Indian corn is about an average crop. Rowen and fall feed are better than for some years. About the usual amount of fall seeding has been done and it is looking very well. Yield of potatoes good, quality fine, not rotting as badly as was expected. Apples very good, pears good but cheap, not many peaches, no plums, grapes not ripening very well, not many cranberries.

Townsend (G. A. WILDER).—Indian corn is about an average crop. Rowen and fall feed are above the usual average in condition. The usual amount of fall seeding has been done and is in good condition.

Onions are not up to the average of former years. Potatoes are an average crop in yield and quality and are better than last year. The prospect is good for root crops, celery and other late market-garden crops. Apples, pears, and grapes are good crops, prices better than last year; peaches hurt by early frosts and not a very heavy crop; plums rotted badly; cranberries a fair crop.

Dunstable (A. J. GILSON).—Indian corn is a good average crop. Rowen and fall feed are above the usual average in condition. Less than the usual amount of fall seeding has been done, but that which has been put in is looking well. Potatoes are below the average in yield but of good quality. Root crops are in good condition. Apples and pears are average crops, peaches and plums light, grapes good, cranberries very light.

Burlington (C. E. MARION).—Rowen is a large crop and fall feed is above the average in condition. Not much fall seeding has been done as yet. Onions are small in size, but the crop is large. Roots will give large crops, but celery has blighted very badly. Apples, pears, peaches, plums, grapes and cranberries are very light crops. Cauliflower and beans have been entire failures this season and tomatoes have blighted very badly.

Lincoln (SAMUEL HARTWELL).—Rowen and fall feed are far in excess of the usual average. Potatoes are a better crop than usual on high land and are of excellent quality. Not much celery grown in this vicinity, squashes and other late market-garden crops are good. Apples and grapes are plenty, other fruits not abundant.

Wakefield (CHAS. TALBOT).—Indian corn is looking very well and is fully equal to former years. Rowen and fall feed are 20 per cent in advance of former years. The usual amount of fall seeding has been done and it is looking very fine. Onions are a good crop. Potatoes are of very good quality but the yield is not quite up to past years. The prospect for root crops, celery and other late market-garden crops is very good. Apples are a short crop, pears good, no peaches, plums good, grapes fine and cranberries a short crop.

Winchester (MARSHALL SYMMES).—Rowen is a very heavy crop and fall feed is also heavy. The usual amount of fall seeding has been done and it has everywhere made a good catch. There are very few onions raised and they are a poor crop. Potatoes are more than an average crop and are of good quality. On some ground celery is good, the late set being better than the early. Cauliflowers are unusually late and are likely to head all together in October. Very few apples, half a crop of pears, no peaches.

Arlington (W. W. RAWSON).—Rowen and fall feed are in good condition. Onions are a very good crop. Potatoes are an average crop in yield and quality. Root crops are much better than usual. Celery is doing well now and promises to be good in quality though light in yield. The prospect for fall crops is good and I think prices will be good for all that are of good quality.

Weston (H. L. BROWN).—Rowen and fall feed are much more than average. Less than the usual amount of fall seeding has been done, but what has is looking well. Potatoes are an average crop in yield and quality. The prospect is good for root crops, celery and other late market-garden crops. There is a small crop of apples, very few pears or peaches, grapes a good crop.

ESSEX COUNTY.

West Newbury (J. C. TARLETON).—Indian corn is a very good crop though late. Rowen and fall feed are far beyond the average this year. Not very much fall seeding has been done, but that which is in is doing fairly well. Onions have done very well. Potatoes are few in a hill

and small at that and are also all rotting. Celery leaves are turning yellow and roots are not doing very well. Peaches, plums and grapes are full crops, while apples, pears and cranberries fall below the average.

North Andover (PETER HOLT, JR.) — Indian corn is a full average crop. Rowen and fall feed are above the average. The usual amount of fall seeding has been done and is in fine condition. Onions are a good average crop. Potatoes are a very light yield and are rotting badly. Root crops, celery, and other late market-garden crops are not as good as usual. Apples are a light crop of poor quality; some peach trees have borne good crops; pears, plums and grapes are small in yield and poor in quality; there is a full crop of cranberries.

Andover (M. H. GOULD). — Indian corn compares favorably with an average crop. Rowen and fall feed are more than average crops. The usual amount of fall seeding has been done and it is in good condition. Onions are a very small crop. Potatoes are not an average crop in yield or quality. The prospect is good for root crops, celery and other late market-garden crops. Fruit of all kinds has not done as well as usual. Cucumbers raised for pickles have been a good crop.

Ipswich (O. C. SMITH). — Indian corn is below the average as to grain and above as to fodder. Rowen is 50 per cent above an average crop and fall feed is plenty. Not as much seeding has been done as usual owing to the wet weather, but what has been put in is growing finely. Onions are 10 per cent above an average crop. Some fields of potatoes were plowed under, some were half rotten, and some gave large yields of good quality. Root crops, celery and other late market-garden crops are all doing finely. All fruits are below the average, grapes mature slowly, apples coloring well.

Wenham (N. P. PERKINS). — What corn is raised in this locality is a good crop. The rowen crop is larger than usual and fall feed is about as good as in other years. Not as much fall seeding as usual has been done as yet, but considerable will be sown late or in the spring. Onions are not generally as good a crop as usual. Potatoes are less than an average crop and the quality is rather poor on low land. Carrots and beets are not average crops and parsnips are not good size. There are but few apples, pears or cranberries, and peaches, plums and grapes are not raised to any extent.

Hamilton (ALVIN SMITH). — Indian corn is more than an average crop. Rowen and fall feed are above the usual average. Less than the usual amount of fall seeding has been done, but that which is in is doing pretty well. Onions are about an average crop. Potatoes are very good in quality but have not made more than half a yield. The prospect for root crops, celery and other late market-garden crops is extra. Apples, pears and grapes are good crops; cranberries a failure.

NORFOLK COUNTY.

Cohasset (E. E. ELLMS). — Indian corn is better than an average crop. Rowen and fall feed are up to the usual average. The usual amount of fall seeding has been done and is in good condition. Onions are a good average crop. Potatoes are not up to the average in either yield or quality. The prospect is good for root crops, celery and other late market-garden crops. All kinds of fruit are very poor crops this year.

Stoughton (C. F. CURTIS). — Indian corn is fully up to the average. Rowen and fall feed are better than usual. The average amount of fall seeding has been done and the condition is first rate. Potatoes are less than an average crop owing to rot, but the quality is all right otherwise. Apples and pears are only half crops; grapes are late in ripening; cranberries are a good crop where flowed, but on meadows are only about a third of a crop.

Dedham (A. W. CHEEVER).—Indian corn is a full average crop. Rowen and fall feed are 15 per cent above the average in condition. The usual amount of fall seeding has been done and it is in average condition. Potatoes appear to be a better crop than was expected with little rot. Root crops, celery and other late market-garden crops are not much grown, but are a full average in quality. Apples declined in condition from last month and are very maggoty, pears in moderate supply, peaches fairly abundant, few plums, grapes a full crop but too late to ripen.

Millis (E. F. RICHARDSON).—Indian corn is about an average crop. Rowen and fall feed are much better than usual. Not quite as much seeding as usual has been done on account of wet weather, but that which has been done looks extra fine. Onions are a fair crop. Potatoes are a good crop both in quantity and quality. The prospect is fair for root crops, celery and other late market-garden crops. There are very small crops of all the fruits.

Franklin (C. M. ALLEN).—The season has been too wet for corn and other grains and less than a full crop has been harvested. Hay, rowen and fall feed have been very heavy crops. Less than the usual amount of fall seeding has been done, but it looks well. Onions are an average crop. Potatoes blighted on many fields and are not over half a crop. Fruit is from one-half to three-fourths of a crop, apples being less than half a crop.

Bellingham (J. J. O'SULLIVAN).—Indian corn is about an average crop. Rowen and fall feed are better than usual. Very little fall seeding has been done. Potatoes are an average crop as to yield and quality. Few apples, pears, peaches or plums; grapes good crop; cranberries less than average.

BRISTOL COUNTY.

Mansfield (WM. C. WINTER).—Corn is somewhat above the usual average. Rowen and fall feed are very much above the usual average. Not quite as much fall seeding as usual has been done, but that which is in is in good condition. Onions are an average crop but are not much raised. Potatoes are below the average in yield and quality but are better than last year. Root crops, celery and other late market-garden crops are all in excellent condition with prospects of the best. Apples and pears are less than average crops; peaches and plums a failure; grapes badly mildewed and not ripening well, but otherwise a good crop; cranberries a fair crop.

Norton (WM. A. LANE).—Indian corn is more than an average crop. There is a large crop of rowen and fall feed is very good. More fall seeding than usual has been done. Onions are a good crop but are not much raised. Potatoes are about an average crop of good quality. The prospect is very good for root crops, celery and other late market-garden crops. Apples have been fairly good, no peaches, plums rotted very badly, and frost has taken some of the cranberries.

Seekonk (F. A. HOWE).—Indian corn is about an average crop. Rowen and fall feed are up to the usual average. The usual amount of fall seeding has been done and is looking fairly well, but needs rain badly. Onions are hardly up to an average crop. Potatoes made an average yield but are badly worm eaten. Root crops, celery and other late market-garden crops are all looking well now. Asparagus looks much better than a year ago and I have not seen any blight this fall. There is a very small crop of all kinds of fruit.

Raynham (N. W. SHAW).—Indian corn is fully an average crop. I never knew rowen and fall feed to be in as good condition. But very little seeding has been done as yet. Onions are less than an average crop. Potatoes have not made a large yield, but the quality is fair. The prospect is good for root crops, celery and other late market-

garden crops. Apples are half a crop, pears three-fourths, plums one-half, grapes one-fourth and cranberries one-half.

Swansea (F. G. ARNOLD). — Indian corn shows heavy fodder, but has not eared quite as well as usual. Rowen and fall feed are above the usual average. About the usual amount of fall seeding has been done, and it is looking well. Potatoes have yielded well, and are of good quality. Dry weather for the last six weeks makes late garden crops very backward. Apples are scarce; pears and peaches about the average; few cranberries.

Westport (A. S. SHERMAN). — Indian corn has done well, and is somewhat above an average crop. Rowen is up to the usual average; fall feed has been good, but is now badly dried up. Very little fall seeding has been done, and that is in poor condition owing to drought. Onions are far below an average crop. Potatoes are up to the usual average. The prospect for root crops is very good, if we have rain soon. Pears are plenty; all other fruits scarce.

PLYMOUTH COUNTY.

Brockton (DAVIS COPELAND). — Indian corn is about an average crop. Rowen and fall feed are up to the usual average. The usual amount of fall seeding has been done, and it is in good condition. Onions are about 90 per cent of a full crop. Potatoes are an average crop in yield and quality. Market-garden crops needed rain at the time of making returns; with rain the prospect is good as a rule. There are not many apples; pears good; grapes late; cranberry crop small. Some fields of celery have rusted so as to damage it, otherwise it is good.

Hanson (F. S. THOMAS). — Indian corn is an average crop. Rowen and fall feed are unusually good. About the usual amount of fall seeding is now being done. Potatoes are an average crop both as to yield and quality. The prospect is good for root crops, celery and other late market-garden crops. Few apples; not many pears or peaches; grapes not up to the average; cranberries all right. There have been two crops of rowen on good land.

Halifax (G. W. HAYWARD). — The fine weather of August has made an average crop of corn. A full crop of rowen has been secured, and fall feed is good. Very little fall seeding has been done, and what has been has not come up owing to the lack of moisture. What few onions were sown are more than an average crop. Potatoes are not average in yield, but are of fine quality. Turnips look fairly well. Very few apples, but cranberries are turning out better than was expected.

Marshfield (J. H. BOURNE). — Corn stover is a little ranker and larger than usual but the grain is not quite as full. Rowen and fall feed are better than usual. Less than the usual amount of fall seeding has been done and it has suffered somewhat from the dry weather of September. Onions are not quite up to the usual average. Late potatoes are nearly an average crop and are of good quality. Turnips will be a light crop, as will also late cabbage. Apples, pears and peaches are less than average crops; cranberries are a full average crop and are ripening well.

Carver (J. A. VAUGHAN). — Indian corn is an average crop. Rowen and fall feed are up to the usual average. Less than the usual amount of fall seeding has been done. Onions are in good condition. Potatoes are a good crop. The prospect is fair for root crops, celery and other late market-garden crops. But few apples, pears, peaches, plums or grapes. Cranberry picking is being pushed this week and is finished on some bogs. The weather has been excellent for the work. We have had three frosty nights and some berries have been killed on unflooded bogs. There is complaint of rot on a few bogs, others free from it. The crop is later in ripening than usual. On the whole I think there will be an average crop of good berries.

Lakeville (ELBRIDGE CUSHMAN).—Indian corn is above the average and is ripening very finely. Rowen and fall feed are the best that can be remembered by the oldest inhabitant. The usual amount of fall seeding has been done and is in good condition. Onions are 90 per cent of a full average crop. Potatoes are fully an average crop, quality good on high land, poor on low places. Apples half a crop, pears 40 per cent, peaches 5 per cent, no plums, grapes 10 per cent and cranberries half a crop.

BARNSTABLE COUNTY.

Bourne (D. D. NYE).—Indian corn is a good crop, better than last year. Rowen and fall feed are more than average crops. Very little fall seeding has been done. The potato crop is fine both in yield and quality. The prospect is very good for root crops, celery and other late market-garden crops. There are no apples to speak of, few pears and grapes, peaches and plums very scarce, cranberries turn out very good but some two or three weeks later than last year.

Falmouth (D. R. WICKS).—Indian corn is hardly an average crop and shows much smut. Rowen is more than an average crop and fall feed never was better. Very little if any fall seeding has been done. Onions are half a crop. Potatoes are below the average in yield but are of good quality. Dry weather makes turnips look somewhat yellow. No apples; few pears, peaches or plums; grapes late; cranberries a fair crop on some bogs while others are poor.

Mushpee (W. F. HAMMOND).—Indian corn is more than an average crop. Rowen and fall feed are about average crops. The usual amount of fall seeding has been done, but it does not look very prosperous on account of the long dry spell. Onions are above an average crop. Potatoes are about an average crop in yield and quality. Root crops are looking well and late market-garden crops also. Apples, pears, peaches and plums are a failure; grapes and cranberries half a crop each.

Dennis (JOSHUA CROWELL).—Indian corn is about an average crop. There was a fair crop of rowen, but fall feed is short. Not much fall seeding has been done. Onions are a full average crop. Potatoes are an average crop in yield and quality. Root crops, celery and other late market-garden crops are a little off owing to prolonged dry weather. Apples a very small crop, pears fair and cranberries medium.

Orleans (F. E. SNOW).—Indian corn is a good average crop. Rowen and fall feed are up to the usual average. Very little if any fall seeding is done. Potatoes are an average crop as to yield and quality. Cranberries are a rather light crop and scalded somewhat; other fruit crops light.

Eastham (J. A. CLARK).—Indian corn is not much grown and is mostly used for fodder. Rowen and fall feed are below the usual average. The weather has been too dry for fall seeding. Potatoes are an average crop both in yield and quality. It is doubtful at present whether root crops, celery and other late market-garden crops will turn out well. There will not be an average fruit crop. Asparagus fields with few exceptions are badly rusted. This section has suffered greatly from drought there having been no rain of any amount for six weeks.

DUKES COUNTY.

West Tisbury (GEO. HUNT LUCE).—Indian corn is a good average crop. Rowen was a good average crop, but the dry weather is damaging the fall feed. But little fall seeding is done here. Potatoes are below the average in yield but of good quality. The prospect is poor for root crops, celery and other late market-garden crops. All fruits except cranberries are a failure.

BULLETIN OF MASSACHUSETTS BOARD OF AGRICULTURE.

MILK AND CREAM.

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GENERAL STRUCTURE OF THE UDDER OF THE COW.

The udder of the cow consists of two milk glands, a left and right, separated from each other by a fibrous tissue (ligamentum suspensorium mamarum). This tissue layer, or wall of division, is connected by elastic muscles with the connective tissue which surrounds the glands, and also with the muscles of the belly, thus holding the milk glands in position.

The two milk glands are each of a reddish gray color, and consist, properly speaking, of a glandular structure known as the gland basket. In case of ordinary mature milch cows, each gland is about $6\frac{1}{4}$ inches in depth and $12\frac{1}{4}$ inches in length. The glandular mass may be divided into lobes, lobules and alveoli. Plumb makes this clear by likening the lobe to a bunch of grapes, the lobules to a single grape and the alveoli to smaller divisions within the single grape. The lobules of the gland are surrounded by a fully developed net-work of capillary vessels, in which the materials for the formation of the milk circulate through the numerous lymph tracts. The alveoli are microscopic terminations of extremely fine canals. They are covered externally with a structureless membrane, and internally are lined with a continuous single layer of epithelial cells. These cells have a diameter of .04 of a millimeter. When the cow is in milk they are swollen and protrude into the alveolian cavity. The microscopic canals, of which the alveoli are the enlargements, unite together among themselves into ever widening ducts — the milk ducts — and end eventually in large, hollow cavities, the so-called milk cisterns or reservoirs.

These cisterns, four in number, situated above each teat, extend upwards into the gland and downwards almost to the end of the teat. The teats, two for each milk gland, are encircled at the lower end with numerous fibers, forming the sphincter muscle, which prevents the escape of the milk under ordinary conditions.

The individual lobules are enveloped in connective tissues, which unite them in a glandular mass, and this connective tissue is in turn covered with adipose tissue, and the whole udder is enveloped by the skin.

FORMATION OF MILK.

In spite of the many investigations concerning the formation of milk there is very little positive knowledge on the subject. Previous to 1840 it was held that the milk glands separated the materials for the formation of milk directly from the blood. Later it was proved that none of these materials existed ready formed in the blood, so the above theory was abandoned. The second theory was suggested by Virchow, formulated by Will, and supported by Viot. They claimed milk to be a fatty degeneration of the *epithelial cells of the alveoli*, — a liquefied cell substance. Heidenhain opposed this view, and claimed that the epithelial cells do not suffer degeneration, but rather only their free ends, the renewal of the cell material taking place at the opposite end. C. Partsch holds that the formation of milk fat is not a result of fatty degeneration, “but rather a special activity of the cell in the true sense of the word.”

Rauber advanced the idea, as a result of his studies, that the fat, casein and milk sugar are derived from the white blood corpuscles. He claims that the lymph rather than the blood vessels are found in direct contact with the alveoli, and that the white blood corpuscles are diffused through the veins and the lymph vessels and then further into the epithelial cells, and there are transformed into the various milk constituents.

It is probable that the milk is not gradually formed and stored in the udder during the day, but rather that the epithelial cells of the alveoli become very much enlarged with various substances going to form the milk, and that just previous and even during milking these distended cells break and the milk thus distributed in the udder is drawn off by the milker. The enlarged udder of the cow for a few hours just previous to milking is not wholly due to the amount of milk it contains, but rather to the distended or congested condition of the glands.

From the above brief outline of the several theories it is apparent that as yet we have but very little definite knowledge of what actually takes place in the glands which results in the production of the white fluid termed milk. It is probable that the fat is derived to some extent from the fat of the blood, but is formed largely as a result of cell activity, and is therefore a secretion. The formation of milk sugar and casein is still largely a matter of conjecture.

It is evident, however, both from practical and scientific observations, that the production of milk depends firstly upon the large development and great activity of the milk glands, and secondly upon the capacity of the animal to consume and digest large amounts of food in order to supply these glands with an abundance of the necessary raw materials.

PROPERTIES OF MILK.*

Milk in its normal condition is a pure, almost white fluid, and perfectly opaque in large quantities. This lack of transparency is due partly to the fat in suspension and partly to a suspension of the nitro-

* In considering this subject it will be understood that cow's milk is always meant, this being practically the only milk used in the United States.

genous and mineral matter. It has a slight smell and a mild, rich, slightly sweetish taste. It possesses a slight amphoteric (alkaline and acid) reaction, due probably to the presence of alkaline carbonate and neutral and acid phosphates. When allowed to stand for any length of time a multitude of minute fat globules rise to the surface, and form a layer of cream. By continuous standing milk coagulates. Coagulation can also be brought about by the addition of small quantities of acid.

THE INGREDIENTS OF MILK.

The larger part of milk consists of water, which contains a variety of substances in suspension and solution. The substances to a considerable extent dissolved in the water are casein and albumen, milk sugar and the ashly matters. This solution forms the so-called *milk serum*. The fat exists in the milk in suspension, in the form of very minute microscopic globules. They are semi-solid and form with the serum what is termed an emulsion.

1. *Milk Fat*.—The fat globules in milk vary in size from .0016 of a millimeter to .01 of a millimeter ($\frac{1}{25000}$ to $\frac{1}{10000}$ of an inch), *e. g.*, microscopically small. The smaller the more numerous they are. As a rule the globules in the milk of the Jersey and Guernsey cows are larger in size than those in the milk produced by Holsteins or Ayr-shires. The globules are largest in the milk of newly calved cows. The percentage of fat in the milk product of the United States may be said to vary between 2.25 and 8 per cent, with a probable average of 4 per cent.

Milk fat contains two kinds of fat, the so-called non-volatile and volatile fats. Neutral non-volatile fat is a combination of glycerine with fatty acids, such as the palmitic, stearic and oleic acids. There is about 92 per cent of non-volatile and 8 per cent of volatile fats in the fat of milk. Duclaux has estimated butter fat to be composed of the following separate fats:—

	Per Cent.
Palmitin, stearin, olein, with traces of myristin and butin,	91.50
Butyrin,	4.20
Capronin,	2.50
Caprylin, caprinin and traces of laurin,	1.80
	<hr/> 100.00

Butter consists largely of milk fat (85 per cent) and hence the value of milk for butter depends upon the quantity of fat it contains

2. *Milk Albuminoids (Nitrogenous Matter)*.—The albuminoid or nitrogenous portion of milk contains five distinct substances, namely, casein, albumin, lactoglobulin, lactoprotein and fibrin.

Casein forms about 80 per cent of the total albuminoids. It exists in the milk, combined with lime in a semi-dissolved condition, and possesses a certain amount of opacity (lack of transparency). The proportions in which the casein and lime exist in combination are 100 parts of the former to 1.55 of the latter.

Casein forms the chief constituent of the milk curd, which separates out when the milk becomes sour. Casein is one of the two chief ingre-

dients of cheese. It is that part of the milk which forms flesh (lean meat), either in the growing animal or the human being.

Albumin differs from the casein in being in a state of complete solution in the milk, and in separating out in the form of scum when the milk is heated from 158° to 167° F. While it exists in comparatively small amounts in normal milk, it is found in large quantities in the colostrum (first milk after calving).

Lactoglobulin, another albuminoid, is present in very minute traces in milk. It resembles the albumin.

Lactoprotein is present in milk to the extent of about .13 per cent. It is found in solution after removing the casein, albumin and lactoglobulin. It has been named albuminose, galactin, galactine, etc.

Fibrin is also claimed by Babcock to exist in milk in quantities of .1 per cent.

3. *Milk sugar* was discovered in milk late in the seventeenth century. It is a crystalline body, white in color, and has the same chemical formula as cane sugar. It occurs only in milk, where it is found in a state of perfect solution. It is not as easily soluble in water as cane sugar, and possesses only a slightly sweetish taste. The amount of such sugar in normal cow's milk varies from 3 to 6 per cent, with an average of about 5 per cent.

4. *Milk ash*, or mineral constituents, consist of potash, soda, lime, magnesia and iron, united with phosphoric, hydrochloric, sulphuric and carbonic acids. The total amount of ash is small, averaging about .75 of 1 per cent. The potash, lime and phosphoric acid form the largest proportion of the ash. The ash, as a source of food, serves to build up the bony structure of the body.

In addition to the above principal ingredients of milk, small quantities of other substances have been recognized. Citric acid has been found to the extent of .1 of 1 per cent, combined with iron and magnesia. Very minute quantities of urea, lecithin, kreatin, hypoxanthin, leucin and tyrosin have also been recognized, formed without doubt from the partial decomposition of the albumin during the process of digestion in the animal body.

Gases in small quantities, such as nitrogen, oxygen and carbonic acid, also exist dissolved in the milk.

While it not possible to give any absolute figures for the composition of milk, the following will show the approximate relative proportions of the several ingredients:—

	Per Cent.
Water,	87.00
Fat,	4.00
Albuminoids { Casein,	2.90
{ Albumin, . . . . .	.50
{ Lactoglobulin, } . . . . .	.15
{ Lactoprotein, }	
Milk Sugar,	4.75
Ash, . . . . .	.70
	<hr/> 100.00

The following figures give the approximate compositions of the milk of different breeds : —

	Total Solids* (Per Cent).	Fat (Per Cent).	Solids not Fat (Per Cent).
Average milk,	13.0	4.0	9.0
Holstein,	11.8	3.2	8.6
Ayrshire,	12.5	3.7	8.8
Shorthorn,	12.9	3.8	9.1
Devon,	13.4	4.4	9.0
Jersey,	14.7	5.0	9.7
Guernsey,	14.7	5.0	9.7

* Containing milk sugar, curd and ash.

While the above figures can be taken as types, they do not mean that every cow of a distinct breed will give milk of the above composition. In fact, a great many Jerseys produce milk with 4 per cent of fat, and families and individual cows of Holstein breed yield milk as rich as do many Jerseys or Guernseys.

Variations in the quality of milk are due to a variety of causes.

The substance showing the greatest variation is the fat, while those remaining more nearly constant are the milk sugar and the ash. The milk is generally poorest in quality, *i. e.*, contains the most water, for the first few weeks after calving, and grows gradually richer till within a few months before calving. As the cow becomes dry the solid matter increases quite rapidly. With some cows the composition of the milk remains nearly constant from the fourth week until the end of the sixth month after calving, while with others a gradual increase in richness is observed. Morning milk is quite frequently poorer in fat than evening's milk. This is largely due to the unequal periods between milkings. As a rule, the shorter the time between milkings the richer the milk in fat and *vice versa*. Cows milked three or four times daily, produce milk richer in fat than those milked but twice. The composition of a single cow's milk will vary from day to day. Such variations are to be attributed to effects of the weather conditions, environment, change of food, etc.

The quality of milk from different portions of the same milking differs widely. The first part of the milk drawn is poorest in fat and the last richest.

Feed has no marked effect on the composition of milk. This statement, however, needs to be qualified. An animal that is poorly nourished, by receiving insufficient food or food containing an excess of carbohydrates and a lack of protein, will give milk of somewhat poorer quality than animals normally fed. An excess of fat in the food will tend to increase the fat in the milk, providing the animal is able to digest and assimilate the fat. Feed appears to affect, to an extent, the quality of the fat in the milk. Thus gluten and linseed meals tend to make a softer oily fat, while cotton-seed meal produces a hard fat. The other

milk ingredients are but little changed. Certain foods also tend to impart objectionable flavors to milk.

Different breeds of cows, as is well known, give milk of varying degrees of richness. Thus Guernseys and Jerseys produce milk with the highest amount of total solids, and Holsteins give milk with the lowest amount. Individual cows, however, show wide differences, irrespective of breed. It is not unusual to find individual Holsteins giving milk as rich as some Jerseys.

PURE AND IMPURE MILK.

Pure milk may be defined as the natural product of a healthy cow, drawn and cared for in a cleanly manner. Milk from diseased cows, or cows in a low physical condition, cannot be considered as pure. Milk from cows affected with tuberculosis of the udder is positively dangerous. There is still a difference of opinion as to whether milk from cows moderately affected with tuberculous lungs, glands or other internal organs is positively dangerous, but in the light of present knowledge it must at least be viewed with suspicion. Milk from some Holstein cows does not contain over 11.5 per cent of total solid matter, and 3 or even less per cent of fat. Such milk, other things being equal, must be considered pure and healthy, only not as rich as that from other cows. Milk drawn from a healthy cow is perfectly sterile, and if the proper precautions are taken, it is possible to keep it for a considerable length of time without change. As soon as the milk is drawn, conditions present themselves which cause the milk to change and become impure.

Impure milk may result from dirty cows, dirty stables, dirty milkers and dirty milk pails. Milk absorbs a bad odor very rapidly, and if left exposed to a bad atmosphere will very soon become tainted. *The primal cause of all the changes which milk undergoes is the result of bacteria.*

WHAT BACTERIA ARE.

Bacteria may be defined as microscopic, one-celled plants, belonging to the lowest plane of vegetable life. There are three typical forms, the spherical, elongated and spiral. These forms may be likened to a ball, a short rod and a corkscrew. Scientifically they are classed as coccus, bacillus and spirillum. These minute plants are of course absolutely invisible to the naked eye. In fact their average diameters may be said to be one thirty-thousandth of an inch. The elongated form have an average length of from .0004 to .001 of an inch.

Bacteria reproduce themselves by division and by spores. By division is meant that a single plant develops a cell wall within itself, and very shortly separates into two plants. Spores are small round bodies formed within the plant, which are thrown off and under suitable conditions of heat and moisture rapidly develop into full-grown bacteria. Bacteria multiply with wonderful rapidity. Many species under suitable conditions will reproduce themselves within half an hour.

Bacteria find their way into milk as soon as drawn. They fall in from the body of the cow, from the hands and clothes of the milker, and

from the dust of the air. Under the most cleanly conditions large numbers of bacteria are found in milk, while when the conditions are reverse, the number is marvellously increased. It may be said that one twenty-eighth of an ounce of milk has been found to contain from 6,000,000 to 170,000,000 bacteria. Bacteria develop most rapidly at a temperature of 100° F. and their development is checked the nearer the temperature is kept to the freezing point.

CHANGES IN PURE MILK.

Impure milk is simply the result of bacterial action.

Sour Milk.—One class of bacteria feeds upon the milk sugar of the milk, and as a result lactic acid is formed. This acid gives the milk its sour taste, and causes at the same time the casein or curd to separate out. The dirtier the animals, stables, milker and milk vessels, the larger the number of bacteria that will find their way into the milk, and the more quickly will the milk become sour. Milk sours more rapidly in hot weather, because the temperature is better suited to the rapid development of the bacteria.

Butter milk is sometimes due to improper food, or condition of the animal, and also to certain bacteria, which, having gained access to the milk, attack the casein and decompose it, producing butyric acid, peptones or other substances.

Ropy or stringy milk is also caused by bacteria, which render the milk more viscous, or cause it to adhere to anything that touches it, drawing out into threads of considerable length.

Red milk is sometimes caused by the actual presence of blood in the milk, due to a wound in the udder or to the effects of certain feeding stuffs. An excess of ensilage has been claimed to produce a bleeding of the udder. Most frequently red milk is due to the presence of bacteria (*Bacillus prodigiosus*). Its growth in the milk is accompanied by the production of a coloring matter, especially near the upper surface of the milk.

Blue milk is the result of the production of a blue pigment of *bacillus cyanogenus*. Blue patches are sometimes noticed on the surface, or the whole surface may become covered with a blue coating.

Soapy milk is occasionally observed, also occasioned by a specific bacteria.

There are forms of bacteria which produce various gases in milk, as well as alcohol and similar substances. Milk being a favorable medium for the growth of all kinds of bacteria, it occasionally happens that the bacteria producing typhoid fever, diphtheria and similar contagious diseases gain access to milk, and result in the milk becoming a transmitter of these most serious diseases.

The bad odors that arise in the stable, and not infrequently in the dairy house, are caused by bacteria which are at work decomposing various kinds of filth found there.

The lactic acid producing bacteria are by far the most numerous in milk, and hence the most ordinary change in milk consists in the process

of souring. Sometimes these bacteria are overpowered by others, and result in the various disagreeable conditions above referred to *

It has become evident from the foregoing that practically all of the various troubles which result in bad milk can be directly or indirectly traced to the different forms of bacteria, which are especially abundant wherever filth of any kind is to be found. This leads us to a brief consideration of

MODERN METHODS OF PRODUCING AND HANDLING PURE MILK.

Healthy Cows.—It is evident that, in order to have pure milk, the producer must start with healthy cows. Diseased animals kept in dark, poorly ventilated stables cannot give healthy milk.

Good Feed.—Practically all kinds of coarse feeds grown upon the farm or concentrated feeds sold in Massachusetts, will produce pure milk if fed at the right time, in suitable quantities. Some feeds as cabbages and turnips, because of a particular flavor, must be fed sparingly and directly after milking. Partially decayed potatoes, cabbages, ensilage, etc., ought to be avoided.

Good Water.—Producers make a great mistake in not looking carefully after the quality of water drank by their cows. Water receiving the drainage from the barn ought never to be used.

Clean Animals.—Farmers are in error in thinking that they can produce clean milk from filthy animals. More or less dirt will most certainly find its way into the milk, with a corresponding bad effect. Animals which are well bedded and cleaned daily present a far more attractive appearance to the eye, and will nearly if not quite pay the cost of the extra labor by the increased milk flow.

Clean Barns.—It is fully realized that farmers producing milk for ordinary trade cannot afford expensive barns. Force of circumstances cause them to house their animals in very plain, inexpensive buildings. It is possible, however, for farmers to give their animals plenty of light, by placing a sufficient number of windows on the south and west side of the barn. Barns can be ventilated cheaply by running ventilating shafts from floor to roof. Barns can be kept clean with very little labor, if the producer has sufficient interest to see that it is done. A force pump and plenty of whitewash will accomplish wonders. Barns can be further disinfected by using a spray nozzle on the pump, and occasionally spraying the interior with a water containing five pounds of creolin for every hundred pounds of water. The gutters, stalls and platforms can be sprayed with the solution with most excellent results.

* Whenever the producer is troubled with bitter, colored or stringy milk, his first effort should consist in a thorough cleaning of barn, cows, dairy house and dairy utensils. The barn, cows and dairy house should be thoroughly cleaned of dirt and dust, and then sprayed, the barn with water containing 5 pounds of creolin for 100 pounds of water, and the dairy house with 6 ounces of bleaching powder to a gallon of water. Creolin is a liquid substance somewhat resembling carbolic acid. It can be purchased of Smith, Kline & French, 429 Arch Street, Philadelphia, at 21 cents per gallon.

Handling Milk.

Before milking the udder and belly of the cow should be well brushed. This takes but a few minutes and is a valuable preventive of impure milk.

The milker should wash his hands before milking, and wear a light inexpensive suit, consisting of overalls and jumper, which should be frequently washed and kept outside the stable. This suit should be removed and well aired immediately after milking. Some producers of so-called "fancy milk" compel their employes to wear white duck suits, but while this makes a better appearance, it is not at all necessary.

The vessels in which the milk is drawn and kept must be thoroughly clean. All milk vessels should first be rinsed with cold water, then thoroughly scalded with hot water, drained and well aired. Unless one is very particular, milk will accumulate in the seams of milk pails and harbor enormous quantities of bacteria, producing the most objectionable results and completely puzzling the producers as to the cause of the trouble.

As soon as the milk is drawn in any quantity it should be removed from the barn to the dairy house. It is a great mistake to have a dairy room opening directly out of the cow stable, for it soon becomes thoroughly impregnated with the barn odor. The dairy house should be sufficiently far removed from the stable to allow a good circulation of air between it and the stable. The milk should here be thoroughly strained, aerated and cooled.

Aeration consists in allowing the milk to run in a thin layer for a distance, exposed to the action of pure air. This is not absolutely necessary, but it most certainly aids in removing the slight animal odor, as well as the various gases the milk contains. It at the same time cools the milk to a temperature of 50° F. The two most common forms of aerators and coolers in use for this purpose are the Star and Champion coolers. These simple contrivances can be found at all dairy warehouses. The Champion has the advantage of allowing a piece of ice to be placed in the water used in the cooler, and but very little water is actually needed. In case of the Star cooler, a current of water must constantly run through the cooler to secure the best results. Milk as it comes from the cooler is drawn into cans or other vessels, and still further cooled by being immersed in vessels containing ice water as near the temperature of 38° F. as possible, and held there till marketed.

It will thus be seen that the secret of having clean, pure milk consists in keeping out all of the bacteria possible, by observing the most rigid rules of cleanliness, and in preventing those that unavoidably gain access from becoming active by holding the milk at as low a temperature as possible. Bacteria being plants, it is impossible for them to grow when the temperature is within six or eight degrees of freezing.

CREAM.

Cream may be defined as that portion of the milk in which has been gathered the largest proportion of fat. It is composed of the same substances found in the milk, but these substances do not exist in the same relative proportions. Cream separates naturally from the milk because of the difference in specific gravity between the globules of fat and the remainder of the milk (milk serum). If milk is allowed to remain at rest in a vessel the fat globules, being lighter than the other ingredients, rise to the surface of the liquid. In so rising they carry with them a portion of the other materials of the milk, and the mixture is called cream. While the composition of the cream varies, especially in its fat content, depending upon the method of separation, the following figures give an idea of an average sample of Cooley cream:—

Cream.	Per Cent.
Water,	72.9
Fat,	18.0
Albuminoids,	3.90
Milk sugar,	4.50
Ash, . . . . .	.69

Methods of Separating Cream.

The three methods of separating cream from the milk may be defined as the shallow pan, deep setting and separator systems.

The quantity of cream for consumption is not seriously affected by either of these methods of separation, so that relative economy depends upon the completeness and cost of separation.

In the separation of cream by force of gravity there is a great loss of fat, and a longer time required, than when the centrifugal process is employed. According to Wing, the conditions of the milk that affect the creaming by the gravity process are first, the size of the fat globules; second, the amount of solids not fat in the milk; third, the character of the solids not fat; and fourth, the temperature of the milk.

The larger the fat globules the more rapidly they separate from the milk. The size of the globules is dependent upon the breed and individuality of the cow, and upon the period of lactation. The amount of solids not fat affects the rising of the cream, because of the difference in specific gravity between the fat and the other ingredients. Solids not fat are heavier than water, and hence the larger the amount of solids not fat the more rapid one would expect the separation. The favorable effects of the solids not fat are, as a rule, however, more than offset by the character of the solids. The solids not fat are the casein, albumin, sugar and ash, and these in the order enumerated increase the viscosity of the milk. This increase in viscosity retards the separation of the fat to a greater degree than the increase in specific gravity tends to aid it. This increase in solids and viscosity takes place as the size of the fat

globules are growing smaller, hence cows in an advanced stage of lactation produce milk which separates very slowly. Finally, a sudden chilling of the milk immediately after milking and keeping it at a temperature of 40° F. aids in a thorough separation of the cream.

Shallow Setting.— This old method has long been discarded by those who understood modern dairy principles. Its chief objection is its inconvenience, and the difficulty of securing a complete separation. As a rule, this method leaves about 20 per cent of the fat in the milk. Milk testing 5 per cent would have 1 per cent of fat left in the skim-milk. If the process is carried out carefully, it is sometimes possible to skim as low as .5 of 1 per cent.

Deep Setting.— Some twenty-five or thirty years ago it was discovered that if milk was set in vessels when first drawn, and rapidly cooled at a temperature of 40° F., and kept at that temperature for twenty-four hours, the depth of the milk could be increased from four to twenty inches, and the separation made much more complete in a shorter time. Several so-called deep-setting systems have been upon the market, the more common one in Massachusetts being the Cooley process. This method hardly needs an extended description, it having been in very general use among Massachusetts dairymen. The tin cans employed are some twenty inches deep by nine inches in diameter, covered with tight-fitting covers, and hold eighteen quarts each. The milk is placed in the cans as soon as drawn, and the latter immediately completely immersed in water at 40° F. and kept there for twenty-four hours. If the milk is from cows that have recently freshened, there will not be much over .2 of 1 per cent of fat in the skim-milk. As cows become advanced in the period of lactation, the skim-milk frequently contains from .5 of 1 per cent to as high as 1 per cent of fat. Taking the year through, the skim-milk from a herd of cows is liable to contain nearly .5 of 1 per cent to 1 per cent of fat. If the milk from a cow producing 6,000 pounds with 4 per cent fat be set by this system, there is liable to be a loss of some 24 pounds or more of butter in the skim-milk. The cream obtained by this process is thin, and varies quite widely in the amount of butter fat it contains, the extreme being from 12 to 24 per cent, with a probable average of 17 to 18 per cent. The disadvantages of this method, aside from the loss of fat, consist in the length of time required to secure a separation, and the amount of ice consumed. The chief advantage consists in the fact that no power is required, the milk being poured from the milk pail direct into the cans and allowed to remain in the water until the skim-milk is drawn off.

Separation by Dilution.— This method has been practised to an extent by those who did not desire to employ ice in large quantities. Deep cans similar to Cooley cans were employed, and the milk diluted with one-half or an equal volume of water, and allowed to stand at ordinary temperature for twelve hours. The skim-milk resulting was found to contain from .70 of 1 per cent to 1 per cent of fat.

Of late, several so-called "dilution or gravity separators" have been placed upon the market, with the claim that a very thorough separation

of fat can be secured. These have been known as Wheeler's gravity cream separator, made by the Gravity Cream Separator Company, Mexico, N. Y.; Hunt's Improved Ventilated Cream Separator, made by the Hunt Manufacturing Company, Cato, N. Y., and the Aquatic Cream Separator, made by the Aquatic Cream Separator Company, Watertown, N. Y. "The machines are simply tin cans fitted with upper and lower scale glasses, a faucet at the bottom through which the milk is drawn, and a wire ring at the top for holding a strainer cloth or cloth cover." "The Aquatic separator differs from the other in the fact that the can is of considerably larger diameter and is provided with another smaller can, intended to be filled with ice and inserted in the large can as a cooler." The milk is mixed with an equal quantity of water and set at ordinary temperature. The cooler issued by the Wheeler Company states that "any time after two or three hours, or between milkings, you can draw off the milk and cream."

The Cornell Experiment Station Bulletin 151 gives considerable information concerning these "machines," from which the above is taken. The results of the investigation of the merits of this method of separation, as given in the bulletin, are as follows:—

"Gravity or dilution separators are merely tin cans in which the separation of cream by gravity process is claimed to be aided by dilution with water.

"Under ordinary conditions the dilution is of no benefit. It may be of some use when the milk is all from 'stripper' cows, or when the temperature of melting ice cannot be secured. (C. U. Agr. Exp. Sta. Bull. 39)

"These cans are not 'separators' in the universally accepted sense of that term and cannot rank in efficiency with them.

"They are even less efficient than the best forms of deep-setting systems, such as the Cooley creamer.

"They are no more efficient than the old-fashioned shallow pan; but perhaps require rather less labor

"In all probability they would give better results if used without dilution and immersed in as cold water as possible, preferably ice water."

Separator (Centrifugal) System.—In the removal of cream by the centrifugal machine, centrifugal force, generated in a rapidly revolving bowl, is used to take the place of the force of gravity. The fat, being lighter than the other milk ingredients, is thrown to the outer surface of the bowl, and a more thorough separation is obtained than by any other method. It is not the intention of the writer to explain in this connection the construction of any style of separator. These machines are coming into general use at present, and bid fair to take the place of the gravity method. Full description of their construction will be found in the explanatory circulars issued by the manufacturers, and in books on dairy subjects. Separators can be regulated so as to produce cream containing from 20 per cent to 50 per cent of butter fat. They have been so perfected that many can be relied upon, if properly manipulated, to

skim to .1 of 1 per cent butter fat or less. This may be illustrated from the following table : —

Machines.	Per cent Fat in Skim-milk.
Accumulator, . . . . .	.11
Alexandria Jumbo, . . . . .	.22
Columbia, . . . . .	.12
Danish Weston, . . . . .	.08
De Laval, . . . . .	.09
Sharples, . . . . .	.16
United States, . . . . .	.12
Victoria, . . . . .	.16

While the majority of separators can be made to do perfect work, there are variations in different machines of the same grade and manufacture, and these differences can only be detected by an actual examination of the skim-milk. The purchaser should therefore purchase a machine with a manufacturer's guarantee of efficiency. So far as the writer is aware, there is no *best* separator. "Other things being equal, that separator is best that will *skim the cleanest at the lowest temperature, and with the least number of revolutions per minute,*" *with the least amount of power.* The two separators in most general use in New England are the De Laval and the Improved United States. The Sharples separator is also used to some extent. Both the De Laval and the Improved United States skim very close. The De Laval requires rather less power to run than many machines. As is well known, there are both hand and power separators. The writer is not particularly inclined towards hand machines, because of the labor involved in turning and would advise those who are purchasing to secure some sort of power, either horse, water motor, gas engine, or steam if more convenient. The separator aids naturally in removing impurities from the milk, and milk is often run through the separator for this purposes alone, and then remixed. These impurities form in what is known as the separator sline. The advantages of the separator, briefly stated, are that the milk can be skimmed as soon as drawn, rapidity of skimming, clean skimming, with thin or thick cream, as desired. Separator skim-milk will not keep sweet as long as skim-milk obtained by the deep-setting process, unless it is cooled and kept at a low temperature at once after coming from the separator. It naturally looks rather thinner than ordinary skim-milk, because of the more thorough removal of fat. The writer believes the separator to be the most economical method of securing milk fat, especially when the producer has a dairy of fifteen or more cows.

PASTEURIZATION OF MILK AND CREAM.

By pasteurization is meant the heating of milk or cream up to a temperature of 155° F., holding it at that temperature from twenty to thirty minutes, and then cooling it rapidly to 50° F. The term pasteurization is derived from the celebrated French chemist, Pasteur, who first suggested the idea for the purpose of increasing the keeping of beer and wine.

The object of holding the milk or cream at this temperature is to destroy or render harmless for a considerable time the various bacteria

contained in the milk, thus preserving it from decomposition. Heating at this temperature, while it kills or renders harmless the bacteria, does not destroy the spores. This destruction of bacteria increases the keeping quality of the milk or cream by several days.

If it is desired to ripen cream for butter making by any special ferment, the pasteurization of the cream, even for a few minutes, so overpowers or partially destroys the ordinary bacteria of the cream that the special bacteria introduced have opportunity to become thoroughly developed.

Sterilization of milk or cream means the heating of it to boiling or even above the boiling point by aid of pressure. This not only destroys the bacteria, but the spores as well, although for a complete destruction of the spores more than one heating is necessary. The so-called Dahl process for making perfectly sterilized milk consists in heating the milk to 158° F. for three quarters of an hour, then cooling to 104° F. for the same time, then heating to 175° F., and finally cooling and placing in sterilized vessels. The object of heating to 104° F. and holding at this temperature for three quarters of an hour is to allow the spores, which were not destroyed by the first heating, to grow. The second heating destroys them. Milk thus treated has been kept perfectly sweet for a long time.

Details to be observed in Pastuerizing. — The milk introduced into the pasteurizing apparatus should be heated as rapidly as possible to 150° or 155° F. and held at that temperature from twenty to thirty minutes. During the heating it should be constantly stirred, to prevent burning on the sides of the vessel. At the expiration of the time the milk should be rapidly cooled to 50° or 60° F. and then drawn off into sterilized bottles or cans, the covers put on at once, and placed in ice water. The bottles can be cleaned by the use of some form of bottle cleaner now on the market. This is to be preferred to the use of chemicals. After washing they should be placed in boiling water for ten minutes, and then placed upon racks, mouths downward, to drain. A better way is to use a sterilizing oven (a jacketed oven surrounded by steam). The bottles can be removed while warm from the oven, and immediately filled.

Milk or cream thus treated will have but a slight cooked taste, and this will almost entirely disappear in cooling. Its chemical composition is not changed, nor its digestibility decreased. It is claimed, on good authority, that pasteurized cream will make a butter superior to that from unheated cream. This is probably due to the fact that pasteurization destroys obnoxious germs, and permits, by inoculation, the development of those favorable to a good quality of butter. Pasteurization causes both milk and cream to become thinner than the normal products, with same percentage of fat. This diminished body is due to the fact that the heat causes the fat globules, which are in clusters or clots, to break apart and become more evenly divided throughout the milk. Babcock and Russell have overcome this by the addition of so-called *viscogen* to the cream.*

Viscogen is prepared by taking two and one-half parts by weight of

* Bull. 54, Wisconsin Experiment Station.

cane sugar and dissolving it in five parts by weight of water. One part by weight of quick lime is gradually slaked in three parts by weight of water. This milk of lime should be slowly poured through a strainer into the sugar solution, frequently stirred, allowed to settle for several hours, and the clear liquid poured or siphoned off and preserved in well-stoppered bottles. One part of this solution is slowly added, with constant stirring, to one hundred and fifty parts of cream. (See Bulletin 54 for further details.) While the addition of this material might be considered as contrary to law in case of milk, it hardly seems possible that there could be any objection to its use in cream. It certainly cannot be considered as objectionable from a sanitary stand-point. In case there should be objections raised against its use, cream thus treated could be designated by some particular brand, such as visco-cream, or the like.

PASTEURIZATION APPARATUS.

Milk or cream can be pasteurized by putting into cans of about the shape and size of those employed in the Cooley process, and placing the cans in a tin or copper tank filled with water. The water should reach a temperature of 165° F. or thereabouts, and the milk, after the temperature has reached 155° F., should be held there for the requisite time and constantly stirred. After the completion of the heating the cans should be brought into water containing broken ice, and the milk stirred and cooled.

In case it is desired to dispose of the milk or cream in bottles it should be drawn into the bottles at once after cooling, and the bottles placed in ice water. It is necessary that the temperature of the milk should be kept low, and that it be thoroughly covered, to prevent any dust particles from gaining access to it. It is not expected that as good results can be obtained by this method, as when special pasteurizing machines are employed, and one who intends pasteurizing to any extent will find it necessary to fit their dairy with special pasteurizing apparatus.

The pasteurizing of milk or cream for butter making, is practised to a slight extent in the United States. Nearly all of the milk that is made into butter in Denmark is first pasteurized, and, it is claimed, with very beneficial results. It is quite probable that this method of treating milk and cream for butter will come into more general use in the United States. There are a great many foreign machines made to accomplish this work, and many of them, it is said, give quite satisfactory results. A number of machines have also been constructed in this country. The one manufactured by A. H. Reed of Philadelphia has been said to give good results. It consists of a combined pasteurizer and separator. The milk is passed through the pasteurizer in a continuous flow, and is separated while hot. It has a capacity of 2,500 pounds per hour. Pasteurizing machines are also on the market for the preparation of milk and cream to be sold as such. One made by Cornish, Curtis & Green, of Fort Atkinson, Wis., has been spoken of favorably. Mosely & Stoddard Manufacturing Company of Rutland, Vt., manufacture a machine which is in use by a number of large milk and cream dealers, who claim to be well pleased with its work. Special circulars are issued, explain-

ing the construction and operation of these machines. Those interested in this subject, as well as in the whole subject of milk and cream production, are referred to special modern publications given at the end of this article

MARKETING OF MILK AND CREAM.

Milk and cream are now being sold to a considerable extent in glass jars in place of tin cans. Glass certainly presents a more attractive appearance than tin. Each purchaser secures an even quality of milk, as the milk is mixed before the jars are filled, and not again disturbed till opened by the consumer. The cream can also be seen through the glass, and the purchaser feels that he has opportunity to see just what he is buying. It is of the utmost importance, if this method is to be successful, *that the jars be kept perfectly clean.*

It is hoped that the time is rapidly approaching when market milk and cream will be sold on a guarantee of quality. As has been already stated, milk will vary in composition from 11.5 to 15 per cent of total solids, and from 3 to 5.5 per cent of fat. Cream contains from 15 to 50 per cent of fat. Milk and cream should not only be properly cared for, and placed on the market in an attractive condition, but it should contain a guarantee of total solids and fat. There should be a price for 3 per cent milk and for 4 and 5 per cent milk, as well as for 20, 30 or 40 per cent cream. This is a matter of justice to the honest producer, as well as to the consumer. It is an encouraging sign to note that some of our more representative dairymen are beginning to carry out this idea.

MODERN BOOKS OF REFERENCE IN DAIRYING.

"Milk and its Products," by H. H. Wing, published by the MacMillan Company, New York.

"American Dairying," by H. B. Gurler, published by Breeders Gazette Print, Chicago.

"Modern Dairy Practice," by Grotenfelt & Woll, published by John Wiley & Son, New York.

"Dairy Bacteriology," by H. L. Russell, Madison, Wis., published by the author.

"The Pasteurization of Milk," by J. H. Mourad, Winnetka, Ill., published by the author.

Year Book, Department of Agriculture, 1894, article on "The Pasteurization and Sterilization of Milk," by E. A. De Schweinitz.

This last book can be had free upon application to Department of Agriculture, Washington, D. C. The other books cost from 50 cents to \$1.00 each and can be obtained through the publishers or quite possibly through the agricultural papers.

MASSACHUSETTS
CROP REPORT

FOR THE

MONTH OF OCTOBER, 1898.

ISSUED BY

WM. R. SESSIONS,

SECRETARY STATE BOARD OF AGRICULTURE.

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CROP REPORT FOR THE MONTH OF OCTOBER, 1898.

OFFICE OF STATE BOARD OF AGRICULTURE,
BOSTON, MASS., NOV. 1, 1898.

Bulletin No. 6, Crop Report for the month of October, is herewith presented as the final issue for this season. We trust that this work is deemed to be of value by the recipients of the bulletins, and in that belief we expect to take up this line of work again the coming spring. We wish to extend the sincere thanks of the office to all our correspondents who have so kindly aided us by their reports, and shall look for a renewal of their kind offices another season.

The special articles printed this season have been as follows : Bulletin No. 1, "Nature's Foresters," by E. H. Forbush ; Bulletin No. 2, "The San José Scale in Massachusetts," by A. H. Kirkland, M.S. ; Bulletin No. 3, "Catch-Crops," by Prof. Wm. P. Brooks ; Bulletin No. 4, "Tuberculosis and the Milk Supply," by Geo. M. Whitaker, A.M. ; and Bulletin No. 5, "Milk and Cream," by Dr. J. B. Lindsey. Particular attention is called to the article on "Stable Disinfection," by Dr. Jas. B. Paige, professor of veterinary science at the Massachusetts Agricultural College and veterinarian to this Board, which will be found printed at the close of this bulletin.

PROGRESS OF THE SEASON.

The October returns of the United States Department of Agriculture (Crop Circular for October, 1898) give the condition of corn on October 1, as 82, as compared with 84.1 on September 1, with 77.1 on October 1, 1897, and with 82.9, the mean of the October averages of the last ten years.

The usual October wheat report is withheld, pending the result of further investigations.

The preliminary estimate of the yield per acre of oats is 27.8 bushels. This is three-tenths of a bushel per acre less than the preliminary estimate of the crop of 1897, but 2.1 bushels per acre above the mean of the preliminary averages of the last ten years. The average for quality is 83.3, against 87.6 a year ago.

The preliminary estimate of the yield per acre of barley is 21.6 bushels, or 2.9 bushels per acre less than in 1897 and 1.3 below the mean of the October estimates of the last ten years. The average for quality reported was 91.3 as compared with 87.6 last year.

The preliminary estimate of the yield per acre of rye is 15.6. This is five-tenths of a bushel less than the average of last year, but 2.2 above the mean of the October estimates for the last ten years. The average for quality reported is 90.1, against 92.7 a year ago.

The condition of buckwheat declined during September 12.6 points, being 76.2 on October 1. This is 14.6 below the average on October 1, 1897, and 8.3 points below the mean of the October averages for the past ten years. This is due largely to the unsatisfactory condition of the crop in New York and Pennsylvania, which together contribute two-thirds of the total production.

The average condition of cotton on October 1 was 75.4, as compared with 79.8 on September 1, with 70 on Oct. 1, 1897, and with 73.9, the mean of the October averages of the last ten years. The decline during September, though by no means uniform, affected the entire cotton-producing region.

The condition of Irish potatoes declined 5.2 points during September. While it is still 10.9 points higher than the October condition of last year, it is 2.7 points below the mean of the October averages of the last ten years.

The apple reports show a continued decline in every State in which this crop is of any commercial importance, except in Maine, Michigan, Nebraska and Oregon, where a slight improvement is indicated.

The yield per acre of hops is generally in excess of last year, California, where it will probably not exceed 1,000 pounds to the acre, being the only exception.

The tobacco reports as a whole are somewhat less favorable than last month.

Exceedingly high averages are again reported for the condition of sugar cane, Louisiana in particular reporting a condition of 101, or 13.5 points above the ten-year average.

The condition of sorghum is not only almost everywhere above the ten-year average at this season of the year, but has sensibly improved during September in almost all the States of principal production.

The condition of rice was generally higher than has been reported on October 1 for some years past, Georgia affording the only exception.

In Massachusetts the average yield of oats per acre, is given as 32 bushels; the average yield of barley as 24.5; the average yield of rye as 16.7; the average condition of buckwheat, October 1, as 90; the average condition of corn as 95; the average condition of tobacco as 102; the average condition of potatoes as 77; and the average condition of apples as 52.

MASSACHUSETTS WEATHER, 1898.

[Compiled from data furnished by the New England Weather Service.]

January was about normal in temperature and considerably above the average in precipitation. There was an unusually severe storm from January 31 to February 1, which was generally considered to have been more severe than the "blizzard" of March, 1888. Heavy snow fell all night, and on the morning of February 1 Massachusetts, with the rest of New England, was completely snowbound. Railroad travel was completely at a stand-still for twenty-four hours, and many vessels were wrecked along the coast, nearly two score mariners losing their lives.

February was above the normal in both temperature and precipitation, but the snowfall was generally moderate throughout the State. The first part of the month was very cold, but later in the month the weather was mild. There was much cloudiness and rain and an unusually severe hail and sleet storm on the 19th to 22d. In the central southern portion of the State much damage was done by ice forming on the trees and stripping them of their branches.

March was remarkably mild and pleasant and at the end of the month the ground was generally in good tillable condition, with the snow gone and frost almost entirely out. The season was considered to be two or three weeks in advance of the average. The precipitation was deficient and the snowfall very light, while the month was singularly free from severe storms and gales. The temperatures were at 60° or above on several days, and the minimum values were unusually high.

The prevailing weather of April was most unfavorable for agricultural pursuits. The remarkably fine weather of March presaged an early spring, but April in some parts of the State was the coldest and wettest on record, and all preliminary farm work was greatly retarded. The average daily temperature deficiency was about 3°. The precipitation was excessive and the number of rainy days large. The latter part of the month was particularly stormy, with precipitation in some part of the State on nearly every day.

May opened with pleasant, mild weather, but by the 3d stormy conditions again prevailed. From the 6th to the 15th the conditions were much more favorable, and practically no precipitation occurred. Several mornings were quite cool and frosty. The weather during the third week of the month was generally favorable, with more sunshine. The last week of the month was remarkable for the amount of cloudiness and rain, caused by the slow passage of a storm up the Atlantic coast. No high gales accompanied this storm, but the temperature remained low, with much fog and thick weather along the coast. Taken together April and May were most unfavorable for farming operations.

June opened unfavorably for the farmer in all parts of the State except the extreme western counties. The total amount of precipitation during the first week was not excessive, but the continued cloudiness retarded the growth of crops and interfered with farm work in general. The week ending with the 13th was almost perfect for crop development. The week ending the 20th was also most favorable. Light frosts occurred but no damage was reported. Bright, sunny days were the rule for the last week. The month was practically normal in temperature, but a slight deficiency in precipitation was noted.

July was a month of extremes in temperature, ranging from a maximum of about 98° on the 3d to a minimum of 48° on the mornings of the 10th and 12th inclusive. The precipitation was deficient during the first half of the month, but later numerous showers brought the amount up to the average. There was a very severe thunderstorm, with very heavy rainfall, in east-central Massachusetts during the afternoon of the 19th. This storm did much good as the ground was beginning to feel the lack of rain. The last few days of the month were generally cloudy, with scattered light showers. The winds during the month were of moderate velocity and mostly from the south-west.

The weather conditions of August were extremely disagreeable. The temperature ranged considerably above the normal and the humidity was excessively high, the last ten days of the month being particularly disagreeable. The rainfall was also excessive and the local thunderstorms were numerous and severe. The storm of the 17th was particularly severe in Boston and the immediate vicinity. The monthly rainfall was considerably less in western Massachusetts than in the central and eastern portions of the State. The average temperature at Boston for the first twenty-five days was 73.2° , — between 3° and 4° above the normal. The winds were of moderate velocity and mostly from the south-west. The amount of cloudiness was above the average.

One of the longest and most sustained warm weather periods on record prevailed during the first seven days of September. The temperature was not remarkably high, but, after hot days, the nights were warm and oppressive, and the average daily humidity was considerably above the normal. Fresh north-west winds on the 8th brought cooler, pleasant weather, which lasted until the 17th, when an area of low barometer brought a short spell of moist, warm weather. This was followed with cooler weather, culminating in light frosts on the mornings of the 21st and 22d. Gloomy weather and temperatures below the normal were prevalent on the 24th and 25th, but the closing days of the month were warmer and more propitious. Altogether, September was extremely favorable for harvesting.

October opened with fine, generally clear weather and temperatures considerably above the normal. This condition continued until the 5th, when it was interrupted by a heavy rain-storm and a decided decline in temperature. The rainfall was heavy along the eastern coast, nearly an inch and a half being recorded at Boston. The second storm occurred on the 8th, and was light in force. Clear weather then prevailed until the 12th, which was showery. Rain again occurred on the 15th, followed by three days of pleasant skies. The latter half of the month witnessed several fine days, but heavy rain-storms were also quite frequent. The heaviest of these storms occurred on the 19th, 22d and 26th. The rainfall for the month as a whole has been copious, and results in an excess over the normal precipitation of about 3 inches. The temperature ranged at nearly normal figures from the 6th to the 9th, inclusive, and the morning of the 10th was quite cool, with heavy and killing frosts in the interior. From the 13th to the 19th the range of mercury was slightly below the usual figures, the 17th and 18th being the coolest days, when the thermometer fell almost to the freezing point. For the entire month, however, the temperature is some 80 degrees in excess of the normal. The maximum temperatures of the month were registered generally on the 3d and 4th, and averaged about 85 degrees. After those dates the mercury did not rise above 75 during the month. The month has been characterized by a general abundance of sunshine. Clear days, averaging 13, have predominated, and the totally cloudy days have been less than 10. No severe wind-storms have occurred, although in the storm of the 26th the wind attained a velocity of about 35 miles. As a whole the month is considered favorable for out-door work and outstanding crops have suffered little damage from frosts or storms.

CROPS OF THE YEAR.

The spring opened about a week later than the normal, with cold weather and excessive moisture in April, and at the end of May the season was still about a week late. Mowings were everywhere in first-class condition and pastures secured a remarkably good start. Fall seeding win-

tered well in almost every case and made a good growing start. The fruit bloom was, on the whole, about average. But little damage from insects was reported. Spraying against insects is not practised as much as it should be. Strictly first-class help was, as always, hard to secure. Wages averaged about \$17 to \$18 per month with board and about \$1.25 per day without board. No marked changes in the acreage of farm crops were reported and no new enterprises in agriculture.

In June insects did not appear to be doing any notable damage, except in isolated cases. Indian corn looked fairly well, though rather backward, with about the usual acreage. Haying had not generally begun, but the crop was generally spoken of as very heavy indeed. The acreage of early potatoes was greatly above the average and the crop generally promised very well. Early market-garden crops were rather late, but those harvested made good yields, with prices ruling about as usual. Dairy products showed a slight increase in quantity with prices about as usual. Pastures were never in better condition. Strawberries were yielding the heaviest crop for years, but the prices were most discouraging. Plums and cherries looked well, but pears were a little off. Apples did not set well and were much below the average. Peaches did not indicate an average crop.

July continued to be remarkably free from insects. Indian corn came forward very rapidly and was generally in good condition. The use of silos is believed to be steadily increasing. The hay crop was everywhere reported as very good indeed and haying was practically completed. The quality of the crop was excellent and it was generally secured in prime condition. The heavy hay crop and the good condition of pastures both operated to reduce the acreage devoted to forage crops, but they were generally in good condition. Market-garden crops were generally in good condition and promising well. Early potatoes were not generally dug, but the crop promised to be rather light. Prices generally ruled high. Apples and pears both promised light crops; plums fair and quinces good; grapes promised well. Pastures suffered somewhat but were still in

good condition. Rye, oats and barley were all about average crops.

Indian corn was looking well as a whole at the end of August, though it was backward in some sections. The rowen crop promised to equal, or even exceed, the phenomenal crop of last year. Late potatoes promised to be a better crop than last year, but were still hardly up to the normal. Blight was quite common and rot was also reported in some sections. Seldom, if ever, has the tobacco crop been as good as that of the present season and cutting was practically completed by the end of the month. Apples promised a small crop. Pears were also light. Peaches were below the average, but grapes promised well. Cranberries did not promise well as a rule. Pastures were in fine condition, seldom, if ever, having been better. Oats and barley were hardly normal crops where raised for grain, but as forage crops were highly satisfactory. Poultry keeping was generally regarded as profitable, but is a side issue except in the south-eastern portion of the State.

The warm dry weather of the early part of September brought corn forward very rapidly, and the absence of killing frosts enabled it to ripen up well where late. Rowen was perhaps the best crop ever cut. Fall feed was also in prime condition in most sections. Less than the usual amount of fall seeding was done, usually because of excessive moisture, but that which was put in was generally in good condition. Onions were rather less than an average crop, there being a marked shortage in the regions of principal production. Potatoes were not an average crop and there were many complaints of rot. There were also many complaints of the tubers being small and few in the hill. Root crops were generally in good condition. Celery hardly promised a full crop. Other late market-garden crops were doing well. Apples were very uneven but the crop appeared to be better than was anticipated. Pears generally yielded well. Peaches did better than usual and brought good prices. Plums yielded well but rotted badly. Cranberries were hardly an average crop, but still were better than the promise of the previous month. Grapes generally showed good yields, but were still on the vines and in danger from frost.

In the circular to correspondents returnable to this office October 22 the following questions were asked : —

1. Have root crops proved to be average crops?
2. What is the condition of farm stock?
3. What is the condition of fall seeding?
4. How have prices for crops raised for market compared with former years?
5. Which of the leading crops in your locality do you think have been most profitable?
6. Which of the leading crops in your locality do you think have been least profitable?
7. Considered as a whole, has the season been a profitable one for your farmers?

Returns were received from 165 correspondents, from which the following summary has been made : —

ROOT CROPS.

Root crops are, generally speaking, in good condition. A few reports of poor condition are made, but these are not numerous, and the crop is probably in advance of an average crop. Dry weather is now needed to allow their being harvested in good condition. Potatoes are very uneven, some fields showing good yields, while others are nearly total failures. As a whole the crop is considerably below the normal. Celery is probably a little less than an average crop.

FARM STOCK.

Farm stock is generally reported as being in prime condition, and bids fair to go to the barn in excellent shape. This good condition is mainly due to the excellent feed in pastures, which has seldom, or never, been better at this time of year. Pastures promise to make an unusually good start next season, the grass roots being in prime shape.

FALL SEEDING.

Considerably less than the usual amount of fall seeding has been done, usually on account of excessive moisture, which made it difficult or impossible to work the land. That

which is in made a good catch, and the frequent rains kept it in good condition, so that it is now in excellent shape and promises well for next year.

PRICES.

Prices for farm crops are thought by many correspondents to have fallen off from former years. The majority still report them as average, but enough reports of lower prices have come in to show a slight shortage in prices. This is, no doubt, largely due to the abundant crops which have been generally obtained, and the falling off in price is probably balanced by the increased amounts produced. Out of 156 answers to this question 98 correspondents speak of prices as average, 18 as higher than usual and 40 as lower. Apples generally sold for higher prices than for some years back.

MOST PROFITABLE CROPS.

There is unusual diversity of opinion among correspondents as to which crops have proved most profitable, less than a majority agreeing upon any one crop. Fifty-six consider hay to have been among the most profitable crops; 43, corn; 36, apples; 29, potatoes; 10, tobacco; 8, fruit; 7, tomatoes; 5, cabbages; 4, asparagus; 3, sweet corn; 3, milk; 3, root crops; 3, forage crops; 3, cranberries; 2, buckwheat; 2, celery; 2, squashes; 1, onions; 1, carrots; 1, beans; 1, turnips; 1, cauliflowers; 1, rye; 1, barley; 1, oats; 1, string beans; 1, lettuce; 1, peaches; and 1, pears.

LEAST PROFITABLE CROPS.

Sixty-two correspondents speak of potatoes as among the least profitable crops; 22, hay; 14, cabbages; 11, strawberries; 10, apples; 10, corn; 7, onions; 7, squashes; 6, fruit; 5, oats; 4, beans; 4, sweet corn; 3, rye; 3, tomatoes; 2, barley; 2, milk; 1, asparagus; 1, parsnips; 1, cucumbers; 1, buckwheat; and 1, cauliflowers.

PROFITS OF THE SEASON.

It seems probable in the light of the returns that the season now closing has been more profitable than usual. Nearly all crops have yielded unusually well, thus making up for

any slight deficiency in prices, and the general feeling seems to be that the season has been a profitable one. One marked exception is in Bristol County, where the correspondents are nearly unanimous in the belief that the season has not been profitable. This feeling is probably largely due to the low prices received for strawberries, one of the staple crops of the county. Of 154 correspondents answering this question, 82 regard the season as profitable, 25 as an average one for profit and 20 as fairly profitable, while 27 think that it has not been a profitable one.

NOTES OF CORRESPONDENTS.

(Returned to us October 22.)

BERKSHIRE COUNTY.

Sheffield (DWIGHT ANDREWS.) — Root crops are fully up to the average. Farm stock is looking well. Fall seeding is looking finely. Full average prices have prevailed for crops raised for market. Apples, corn and buckwheat have been our most profitable crops. Farmers have no reason to complain of the present season.

Alford (L. T. OSBORNE). — Root crops are a good average. Farm stock is in much better condition than usual, having had better feed. Fall seeding is in fine condition. The price of hay is lower than usual, other crops about the same. Hay has been our most profitable crop and corn our least profitable one. The season has been about an average one, though some think it is below the average. The lowest prices ever known have been received for butter and eggs, for three months in the spring the creamery returned only 13 cents and the price of eggs was only 10 cents.

Monterey (WM. S. BIDWELL). — Root crops are about average. Farm stock is in good condition. Very little fall seeding has been done. Prices have ranged about as usual or a little higher. Potatoes, cabbages and turnips have been our most profitable crops, but some fields of potatoes have been almost total failures. Considered as a whole the season has been a profitable one. Our principal industry is grazing and dairying and beef and butter have been higher than for the past few years.

Otis (S. H. NORTON). — Root crops are about average. Farm stock is in good condition. Very little fall seeding has been done. Prices for farm crops are about average except for hay. Corn and potatoes have been the most profitable crops, and hay has been the least profitable as there is no sale for it. I think the season has been an average one for the farmers. Stock of all kinds is scarce and high.

Richmond (T. B. SALMON). — Root crops have proved to be about average. Farm stock is in good condition. Very little fall seeding has been done. Prices for crops raised for market have been about average. Hay has been our most profitable crop and potatoes our least profitable one. Considered as a whole the season has been a profitable one.

Hinsdale (S. M. RAYMOND). — Root crops have been about average. Farm stock is in good condition. Fall seeding is in good condition. Prices have averaged about as usual, some being higher and some lower. Hay has been our most profitable crop and potatoes our least profitable one. Considered as a whole the season has not been a profitable one. Apples bring more than last year and cider apples bring more than ever before.

Windsor (H. A. FORD). — Root crops have proved to be average crops. Farm stock is in very good condition. Fall seeding is looking fine. Prices have ranged about as usual for the crops raised for market. Potatoes and apples have been our most profitable crops. Considered as a whole the season has been a fairly profitable one.

Huncock (C. H. WELLS). — Root crops have proved to be about average. Farm stock is in unusually good condition. Very little fall seeding has been done. The price of potatoes is less than last year at this time. Potatoes and corn have been our most profitable crops and onions our least profitable one. Considered as a whole the season has been fairly profitable. Most of our farmers send cream to the creamery and the price received for butter fat has averaged 20 cents per pound for the last six months, compared with 19 cents for the same period last year. The apple crop is considerably short of that of 1897 and on account of recent high winds most of the crop will be picked from the ground.

Williamstown (S. A. HICKOX). — Root crops have proved to be average. Farm stock is in fine condition. Fall seeding is in excellent condition. The prices for farm crops have compared favorably with former years. Hay has been our most profitable crop and potatoes our least profitable one. Considered as a whole the season has been fairly profitable. Butter is bringing a good price and will be in demand through the winter.

FRANKLIN COUNTY.

Charlemont (H. S. GILES). — Root crops have proved to be good average crops. Farm stock is in very good condition. The weather has been favorable and fall seeding is in very good condition. Prices for farm crops have been about average. Tobacco

has been our most profitable crop and small fruits our least profitable ones. Considered as a whole the season has been a profitable one and all kinds of crops have been very good. Eggs reached the lowest point, 10 cents per dozen, that they have in a number of years.

Colrain (A. A. SMITH). — Root crops have proved to be about average. Farm stock is in good condition. Fall seeding is in fine condition. There has been a slight increase noted in the prices of farm crops. Fruit, especially apples, has been our most profitable crop and potatoes our least profitable one. I think the season has been a profitable one as a whole.

Shelburne (G. E. TAYLOR). — Stock is in extra good condition. Fall seeding is a success in every way. Apples have been our most profitable crop and corn and potatoes our least profitable ones. Considered as a whole the season has been a profitable one. Corn was not more than half a crop and potatoes are total failures on some fields and good on others. Apples are fair in quality and bring a remunerative price.

Conway (JABEZ NEWHALL). — As far as I know root crops have been above the average. Owing to the abundance of feed stock is in fine condition. Fall seeding is looking remarkably well. It is rather early to determine prices as yet but apples are selling pretty well. It is impossible to state which crops have been most profitable as they are not yet sold, but butter, our principal dairy product, has been selling well. With progressive farmers the season has been a fairly profitable one.

Deerfield (CHAS. JONES). — Root crops are a fair average but are selling rather low. Stock in pastures has done well and when sold brings good prices. Hay is a very large crop but sells very low. Potatoes show some good crops but more light ones with prices fair. Corn is not yielding quite as much as was expected but is very sound. Apples are a very light crop but sell for a good price. Tobacco is one of the best crops in years and cured well and is about ready to take from the poles. Onions have been a rather light crop and are selling low.

Sunderland (J. M. J. LEGATE). — Root crops are not up to the average. Farm stock is looking well there having been plenty of rain and no frosts to date. Fall seeding never looked better. Prices for farm crops have been about the same as for the past few years. We hope and trust that tobacco will pay better than any other crop and consider that onions have been our least profitable crop. The season has not been a profitable one so far, but with good prices for tobacco and what the farmers may get out of their

hay, corn and ensilage we hope that the balance will be on the right side by another season.

Leverett (W. L. BOUTWELL). — Root crops have proved to be average crops. Farm stock is in extra good condition. Fall seeding is in good condition. Prices have been lower for crops raised for market than in former years. Tobacco has been our most profitable crop and potatoes our least profitable one. Considered as a whole the season has been a profitable one.

Wendell (N. D. PLUMB). — Root crops have proved to be average ones. Farm stock is looking well and prices rule higher than for years. Fall seeding is looking well. Prices for farm crops are somewhat higher than in former years. Hay and corn are our most profitable crops, and potatoes and apples our least profitable ones. The season has been a profitable one as prices have ruled higher on all farm products with the single exception of butter.

New Salem (DANIEL BALLARD). — Root crops have proved to be average crops. Farm stock is looking remarkably well. Fall seeding is in excellent condition. Prices for farm crops are well maintained. Apples are higher than usual. Apples are our most profitable crop and potatoes our least profitable one. Considered as a whole the season has been a full average one.

HAMPSHIRE COUNTY.

Ware (J. H. FLETCHER). — Root crops have proved to be good average crops. Farm stock is in very good condition. Not much fall seeding has been done. Prices for farm crops have ruled about as usual. Hay, potatoes and apples have been our most profitable crops. I think the season has been a profitable one considered as a whole.

Belchertown (H. C. WEST). — Root crops are more than an average. Farm stock is in good condition. Fall seeding is in good condition. Barring hay prices have ranged about as in years past. Roots, corn and hay have been our most profitable crops and fruit our least profitable one. Considered as a whole the season has been a profitable one.

Pelham (J. L. BREWER). — Root crops have been about average. Farm stock is in good condition. Fall seeding is in good condition. Prices for farm crops have been lower than in former years. Corn and hay have been our most profitable crops and potatoes our least profitable one. Considered as a whole the season has hardly been a profitable one.

Hadley (L. W. WEST). — Root crops are up to the usual average. Farm stock is in better condition than usual. Fall seeding

is in fine condition. Prices for farm crops have been lower than usual. Tobacco has been our most profitable crop as far as sold and potatoes and cabbages our least profitable ones. I think the season will be a profitable one but it is too early to form an opinion, as we do not know what we shall get for our tobacco or for feeding our corn and hay.

South Hadley (H. W. GAYLORD). — Root crops are very good although the yield of potatoes and turnips is very uneven. Farm stock is in the best of condition, feed having been very abundant all the season. Fall seeding is in fine condition. Prices have averaged about as usual, for while some crops have been low apples and potatoes have been high. It is difficult to say what crops have been most profitable, apples and potatoes sell well but are short crops, hay is a heavy crop but does not sell well. The season has not been a profitable one except in rare instances. This year has demonstrated more fully than any previous year the value of spraying fruit trees, as those who attended to it are now reaping their reward in a fine crop of apples, while those who neglected it have only inferior fruit.

Northampton (D. A. HORTON). — Root crops are in very good condition. Farm stock is in good condition. Fall seeding is looking well. Prices for farm crops are a very little higher than last year. The prospect is that tobacco is our most profitable crop. Potatoes are our least profitable crop. Considered as a whole the season has been a profitable one. To all appearances we have the finest crop of tobacco in twenty years.

Westhampton (F. A. BRIDGMAN). — Farm stock is in good condition. Fall seeding is in good condition. Apples bring higher prices than usual while potatoes are cheaper than usual. Apples are bringing from \$1.50 to \$2 per barrel. Hay has been the most abundant crop of the year. Considered as a whole the season has not been a profitable one for our farmers.

Worthington (C. K. BREWSTER). — Root crops are about average. Farm stock is in good condition. Fall seeding is in good condition. Prices for farm crops have generally ruled lower than usual. The hay crop, usually our most valuable crop, sells at very low prices, on account of the abundant yield. The apple crop has been quite good and will bring in a good deal of money; winter fruit is selling at from \$1 to \$2 a barrel. There is a good sale for dairy products at good prices. Considered as a whole the season has been a fairly profitable one.

Plainfield (S. W. CLARK). — Root crops are about normal. Farm stock is in very good condition. Fall seeding is in fair condition. Apples are selling at from \$1.50 to \$3 per barrel. Corn

was one of the best crops ever known and hay is also a very heavy crop. Potatoes have been our least profitable crop. Considered as a whole the season has been a profitable one. Creamery patrons have received a little more money than last year.

HAMPDEN COUNTY.

Blandford (E. W. BOISE). — Root crops are up to the usual average. Farm stock is in good condition. Fall seeding is 10 per cent below the usual average of condition. Hay is low in price, dairy products about average, apples well up in price. Apples are our most profitable crop and potatoes our least profitable one. All things considered our farmers have little to complain of. The great lack now is stock to consume the hay and forage crops harvested.

Russell (E. D. PARKS). — Root crops are about average. Stock is looking very well, better than common. Fall seeding is looking finely. Prices for crops have ranged about as usual. Potatoes are our most profitable crop. It is hard to say what crop has been least profitable, but corn was not very good. Considered as a whole the season has been a profitable one, hay is very low in price but just as valuable to feed. Cider apples are in demand at good prices and many have sold instead of making cider themselves.

Granville (JOSEPH WELCH). — Root crops are up to the usual average. Farm stock is in good condition. Fall seeding is in fine condition. Prices have ruled higher than formerly for those crops raised for market. Apples, corn, barley, oats, and cabbages are our most profitable crops and potatoes our least profitable one. Considered as a whole the season has been a profitable one for our farmers.

West Springfield (N. T. SMITH). — Root crops are up to the usual average. Farm stock is in fine condition as pasturage has been unusually good. Less than the usual amount of fall seeding has been done, but it is looking well. The best crop in yield has been grass and it will prove most profitable if dairy products bring a fair price. Apples, cabbages and beans have been our least profitable crops. There has been but little, if any, profit this season.

Longmeadow (W. F. EMERSON). — Potatoes are a light crop and not as good quality as usual. Farm stock is in good condition for winter. Fall seeding has taken well. Prices for farm crops have been low but there have been ready sales. Hay is our most profitable crop. Apples are a very light and poor crop. The year has

been an average one ; many crops are abundant ; prices low but equivalent in amount to other years.

Wilbraham (F. E. CLARK). — Mangolds and turnips are about the only root crops raised and are full average crops. Farm stock has had an abundance of fall feed and is in good condition. Fall seeding is remarkably good, especially early seeded. Hay has been very low in price, cereals about average, potatoes above the average. Corn, hay and buckwheat have been our most profitable crops, and squashes, cabbages and apples our least profitable ones. The bank accounts of our farmers have not grown much this year.

Ludlow (C. B. BENNETT). — Root crops are above the average. Farm stock is in first-class condition. Fall seeding is in excellent condition. Hay and straw are lower in price than usual and potatoes and apples are higher. Potatoes have been our most profitable crop and rye our least profitable one. Considered as a whole the season has been fully up to the average. Nearly every farmer has a full barn but stock is rather scarce.

Monson (A. H. WHITE). — Root crops are nearly an average. Farm stock is mostly looking well. Fall seeding is in fair condition, but is rather late. Strawberries were pretty low in price ; prices for other crops average. Hay is very low and no sale and potatoes do not bring as much as they ought to considering the cost of raising. There is no real profit in ordinary farming, though there may be some specialties which will pay a profit. Apple buyers are plenty and they seem to be willing to pay a fair price.

Holland (FRANCIS WIGHT). — Root crops are hardly up to the average. Farm stock is looking well. Not much fall seeding has been done. I think prices are fully up to the average when everything is considered. Potatoes and apples have been our most profitable crops and corn our least profitable one. I should say the season had been about an average one.

WORCESTER COUNTY.

Dudley (J. J. GILLES). — Root crops are up to the usual average. Farm stock is in prime condition. Fall seeding is in very good condition. Prices for farm crops have been lower than usual with the exception of string and shell beans. Hay and forage crops have been our most profitable crops and cabbages and potatoes our least profitable ones. All things considered I think the season has been a profitable one.

Southbridge (G. L. CLEMENCE). — Root crops are a good average. Farm stock is in good condition. Fall seeding is in good condition. Prices have compared favorably with those of former years. Hay has been our most profitable crop and potatoes our least

profitable one. Considered as a whole the season has been a profitable one for our farmers.

North Brookfield (J. H. LANE). — Root crops are usually up to the average. Farm stock has seldom been in better condition. Fall seeding is generally in good condition. Prices have been about as usual except for hay which has fallen off 25 per cent in price. Apples are our most profitable crop and potatoes our least profitable one. Milk shippers are well fixed owing to the heavy hay crop. Those who grew squashes hit it as it has been a poor year for bugs and squashes have done well. Late cut rowen has been spoiled by rain.

Petersham (S. B. COOK). — Root crops are 10 per cent above the average. Farm stock is in very fine condition indeed. Fall seeding is in good condition and has made a rank growth. Prices for crops raised for market are about as usual. Corn and hay lead in productiveness and on the whole are probably our most profitable crops. Potatoes are our least profitable crop. Apples are plenty, but many have sold them at very moderate prices. I think the season has been a profitable one considering the advanced price for dairy products and the increased growth of farm stock.

Royalston (C. A. STIMSON). — Root crops are up to the usual average. Farm stock is in good condition. Fall seeding is in good condition. Prices are ruling lower than in former years. Everything considered potatoes have been our most profitable crop and squashes our least profitable one. What few apples there are are bringing good prices. Considered as a whole the season has been a profitable one.

Westminster (I. DICKINSON). — Root crops are generally good. Farm stock is in very good condition. Not much fall seeding has been done on account of wet weather. Prices have ruled about as usual. Hay, corn and squashes have been our most profitable crops and fruit our least profitable one. I think the season has been more than an average one.

Hubbardston (C. C. COLBY). — Nearly all root crops have made good growth and are above the average. All stock is looking well, cows in first-class condition. What little fall seeding has been done promises to be a good catch. Potatoes are a little above the average in price and other crops are about average. Corn and potatoes are the leading crops and the most profitable in this locality. The apple crop is much larger than was expected and prices range from \$1.50 to \$2.50 per barrel. This season has been a good one for our farmers.

Fitchburg (JABEZ FISHER). — Root crops are up to the usual average. Farm stock is in good condition. Prices average a

little lower than usual, but some are higher. Tree fruits, to those few fortunate enough to have them, and early potatoes are our most profitable crops. Farmers as a rule have not been able to lay up any surplus income. A few apple orchards have yielded well and if the fruit is held and well handled will be likely to be profitable, but such cases are the exception.

Harvard (J. S. PRESTON). — Root crops are a good average. Farm stock will come to the barn in more than average condition. Fall seeding is looking better than usual. Apples are the leading crop this year; about half a crop but prices are very good indeed. Milk is our principal product and as hay is abundant our farmers are feeling better than for three years past.

Clinton (P. B. SOUTHWICK). — Root crops have been up to the usual average. Farm stock is in more than average condition. Fall seeding is in fairly good condition. Prices have ruled somewhat below the average. Hay and potatoes are our most profitable crops and squashes and small fruits our least profitable ones. Prices have been so low that the season has not been a profitable one.

Northborough (J. K. MILLS). — Root crops have proved to be up to the usual average. Farm stock never looked better. Fall seeding is in the best of condition. Prices on crops raised for market are about the same as in former years. Apples, asparagus and corn have been our most profitable crops and potatoes, cabbages and squashes our least profitable ones. I think our farmers will close the season's work with a fair compensation for their labors.

Worcester (S. A. BURGESS). — Root crops are up to the usual average. Farm stock is in first-rate condition. Fall seeding is in good condition. Prices for farm crops have ruled lower than in former years. Hay has been our most profitable crop and apples our least profitable one. Grass, hay and fodder crops have been unusually good. All other crops have been below the average except Indian and sweet corn, which have been quite an average. Considered as a whole the season has been a profitable one for our farmers.

Millbury (C. H. STOCKWELL). — Root crops are up to the usual average. Farm stock is in good condition. Fall seeding is in very good condition. I think prices for farm crops have compared well with former years. Corn and hay have been the largest crops. Cabbages have been very low in price. Considered as a whole the season has been a profitable one.

Sutton (O. P. JOHNSON). — Root crops are about average. Farm stock is in splendid condition. Not as much fall seeding as usual

has been done. Prices for farm crops have ruled a little lower than usual. Apples bid fair to be our most profitable crop and hay is our least profitable one in comparison to what it has formerly been. Considered as a whole I do not think the season has been a profitable one.

Mendon (J. N. NUTTER). — Root crops have proved to be up to the usual average. Farm stock is in very good condition. Fall seeding is not very good on account of wet weather. I think the apple crop is our most profitable crop and the hay crop our least profitable one. Considered as a whole the season has been a profitable one for our farmers.

MIDDLESEX COUNTY.

Hopkinton (W. V. THOMPSON). — Root crops are up to the usual average. Farm stock is in good condition. Fall seeding is in good condition. Most crops are low in price. Potatoes have been a very profitable crop. Corn is husking out very well, ears large and well filled out. Strawberry vines are looking well. The mowing fields are looking remarkably well for the time of year. Considered as a whole the season has been a profitable one.

Sherborn (N. B. DOUGLAS). — Root crops are good average crops. Stock is coming to the barn in good order owing to abundant pasturage. Fall seeding looks uncommonly well. Prices have ranged about average. Apples have been our most profitable crop and hay our least profitable one looking at it from a commercial standpoint. Many of our farmers have got good returns from their apples and peaches and dairy farmers have had a fairly satisfactory season.

Stow (G. W. BRADLEY). — Root crops will average about as usual. Farm stock is looking very well. Fall seeding looks well. I think prices for farm crops will average a little better than for the past few years. Apples are our most profitable crop. While not as large as two years ago it is better than in most towns in this vicinity and they have sold at very good prices. The season has been a good one for most of our farmers.

Sudbury (E. W. GOODNOW). — Root crops are up to the usual average. Farm stock looks unusually well. Fall seeding is looking extra good. Prices for crops raised for market have been about normal this season. All kinds of fruits and tomatoes have been our most profitable crops and sweet corn and potatoes have been our least profitable ones. Apples have sold unusually well, bringing \$2 per barrel at the cars. I think the season has been a profitable one.

Littleton (G. W. SANDERSON). — Root crops are up to the usual average. Farm stock is in good condition. Fall seeding is rather backward. Prices for crops raised for market have compared favorably with other years. Hay has been our most profitable crop and oats and barley our least profitable ones. The apple crop is not as large as in 1896 but more money will be received by the farmers for the same. Considered as a whole the season has been a profitable one.

Ashby (ANSON WETHERBEE). — Root crops are all up to the usual average. Farm stock is looking as well as in any fall for years. Not as much fall seeding as usual has been done, but what is in is looking finely. Prices are a little above the last three years. Apples and corn have been our most profitable crops and cabbages, tomatoes and rye our least profitable ones. Apples have sold well though much complaint is made that not enough care is taken in putting up the fruit. Considered as a whole the season has been the most profitable for years.

Pepperell (P. J. KEMP). — Root crops are above the usual average. Fall seeding is looking the best for several years. Prices for farm crops have ruled about as usual. Grass has been the most profitable crop. The greater part of the apples hereabouts have been sold at about \$1.60 per barrel, ones and twos mixed, and dumped into the cars loose. Taking the apple crop into consideration I think the season has been a profitable one.

Chelmsford (P. P. PERHAM). — Root crops are good in quantity and quality. Farm stock has gone through the season in good condition. Fall seeding never was in better condition. Prices of crops raised for market have been below the average. The apple crop has been our most profitable crop, though not very large. The hay crop is so large that there is almost no sale for it. As a whole the farmers have had a fairly profitable season.

Carlisle (E. J. CARR). — Root crops are up to the usual average. Farm stock is in good condition. Fall seeding is in good condition. Prices have averaged well the present season. Asparagus and corn have been our most profitable crops and strawberries our least profitable one. The apple crop is very profitable this season. I should recommend raising the early varieties of the best kind and sending them to market as soon as mature. Considered as a whole the season has been a profitable one for our farmers.

Concord (W. H. HUNT). — Root crops are up to the usual average. Farm stock is in good condition. Fall seeding is looking well. Prices for crops raised for market have been low. Apples, pears and peaches have been our most profitable crops and strawberries

and garden truck our least profitable ones. Compared with former years the season has not been profitable, though those farmers who have apples have no reason to complain.

Woburn (W. H. BARTLETT). — Root crops are full average crops. Farm stock is in very good condition indeed and pastures were never in better condition at this time of year. Fall seeding is in good condition. Prices for farm crops have averaged a little better than usual. Asparagus, string beans, lettuce and tomatoes have been our most profitable crops and cabbages, squashes and small fruits have been our least profitable ones. As far as banking money is concerned no year is profitable, but this year has been as prosperous as any recent one.

Winchester (MARSHALL SYMMES). — Root crops are rather above the average. Farm stock is in good condition. All fall seeding got a good start. The general average of prices has been slightly higher than usual. Beans, tomatoes, celery and cauliflowers have been our most profitable crops and sweet corn and cabbages our least profitable ones. Considered as a whole the season has been a profitable one.

Arlington (W. W. RAWSON). — Root crops are fully up to the average. Fall seeding is in good condition. Prices have been somewhat better for farm crops than for the past two years. All our crops have done well but there was no profit in any. The season has not been a profitable one on account of the large amount of wet weather, which has prevented crops from maturing well.

ESSEX COUNTY.

Salisbury (WESLEY PETTENGILL). — All root crops are good. Farm stock is looking well and pastures have been better than usual. Fall seeding is looking well where sown. Prices are low on all farm crops except apples. Hay has been our most profitable crop in spite of low prices and potatoes our least profitable one on account of rot. I do not think the season has been a profitable one as prices have been low and it has been a bad, wet season.

Amesbury (F. W. Sargent). — Root crops are up to the usual average though carrots are rotting in the ground in many places. Farm stock is in good condition as there has been plenty of feed. Fall seeding is in good condition. Prices have been rather better than for three years past. Onions, cabbages and apples are our most profitable crops and potatoes our least profitable one. The season has been a profitable one, milk farmers have lots of forage, vegetable farmers have found something salable all summer and have had considerable fruit to sell.

Groveland (ABEL STICKNEY). — Root crops are up to the usual average. Farm stock was never in better condition. Fall seeding is in uncommonly good condition. Prices have ruled fairly high for all crops raised for market. Hay, corn and forage crops have been our most profitable crops. The season has been as profitable as the average, but our farmers have not been made very rich.

Ipswich (O. C. SMITH). — Root crops are fully up to the usual average. Farm stock is generally in the best of condition. Fall seeding has made a good catch and looks well. Prices for farm crops have been about as usual. Hay and potatoes have been our most profitable crops and corn and apples our least profitable ones. I think the season has been a profitable one as no crop has been a general failure and this has been a prosperous season for the dairy.

Wenham (N. P. PERKINS). — Carrots, beets, onions and parsnips are below the usual average. Farm stock is looking well and fall feed is good. Not as much fall seeding as usual has been done owing to the wet weather. Prices for farm crops are said to be lower than usual. Tomatoes, squashes and carrots have been our most profitable crops and potatoes, parsnips, onions, strawberries, cucumbers and sweet corn our least profitable ones. I do not think the season has been a profitable one.

Danvers (C. H. PRESTON). — Root crops are up to the usual average. Farm stock is in good condition. Fall seeding is in very good condition. Prices have been about average for crops raised for market. Potatoes have been our least profitable crop. Considered as a whole the season has been a profitable one.

Manchester (JOHN BAKER). — Root crops have proved to be average crops. Farm stock is in good condition. Fall seeding is in good condition. Prices have ruled about as usual. Hay has been our most profitable crop and strawberries our least profitable one. The season has been a good average one.

NORFOLK COUNTY.

Cohasset (E. E. ELLMS). — Root crops have been up to the usual average. Farm stock is in good condition. Fall seeding is in good condition. Prices have been very much lower this year than previously. Corn has been our most profitable crop and potatoes our least profitable one. The season has not been a very profitable one.

Randolph (R. A. THAYER). — Root crops are up to the usual average. Farm stock is generally in first-class condition. Fall seeding is in good condition. Crops have sold at good average

prices. Hay has been our most profitable crop. All our leading crops have yielded fairly well. The apple crop is about one-half of an average crop, but the quality is above the average and they are selling at good prices. Considered as a whole the season has been a profitable one.

Canton (E. V. KINSLEY). — Root crops are up to the usual average. Farm stock is in very good condition. Fall seeding is looking well. Prices for farm crops have ruled low. Hay, apples and tomatoes have been our most profitable crops and potatoes our least profitable one. Winter cabbage and turnips are very good but have not yet been gathered. The season has been a fairly profitable one. The mainstay of the farmers in this locality is the sale of milk and there has been a demand for all dairy products. Winter apples are about harvested and are of good quality, though I find the Baldwins inclined to decay thus early.

Dedham (A. W. CHEEVER). — Root crops are fully up to the usual average. Farm stock is generally in good condition. Fall seeding is in better than average condition. There is no particular difference in the price of farm crops. The season has been generally favorable to the growth of crops, but prices do not give much profit after expenses and taxes are paid.

Medway (MONROE MORSE). — Root crops are up to the usual average. Fall seeding is in good condition. Prices for farm crops have been low this season. Almost all the leading crops have been unprofitable. The hay crop was very heavy and of average quality, but the price is so low that a half crop at old prices would be more profitable. There is no profit in farming now.

Norfolk (G. E. HOLBROOK). — Root crops are up to the usual average. Feed holds out as green and nice as in June and farm stock is in good condition. Fall seeding is looking finely. Potatoes are lower in price than usual; all other crops bring better prices. Early potatoes and tomatoes are our most profitable crops and corn and late potatoes our least profitable ones. I think the live farmer who is not afraid to work has no cause to complain.

Franklin (C. M. ALLEN). — Root crops are up to the usual average. Farm stock is in good condition. Fall seeding is in average condition. Prices for farm crops have ruled about average. Fruit has been our most profitable crop and potatoes our least profitable one. Considered as a whole the season has not been a profitable one. There can be no profit so long as the farmer is legally plundered by combined capital.

BRISTOL COUNTY.

Mansfield (WM. C. WINTER). — Root crops are up to the usual average. Farm stock is in excellent condition. What little fall seeding has been done is in excellent condition. Prices for farm crops have generally ranged lower than for some years. Hay has been our most profitable crop and potatoes our least profitable one. Winter apples are not at all plenty. Considered as a whole I should say the season had been a profitable one.

Norton (WM. A. LANE). — Root crops have proved to be average. Farm stock is in good condition. Fall seeding is looking well. I think that prices have averaged about as usual. Hay has been our most profitable crop and strawberries our least profitable one. Considered as a whole the season has been a profitable one.

Raynham (N. W. SHAW). — Root crops are about up to the usual average. Farm stock is in good condition. Fall seeding is in very good condition. Prices for crops raised for market have ranged as high as usual. Potatoes have been our most profitable crop as a whole and hay our least profitable one. In my opinion the season has not been a profitable one.

Dighton (J. N. PAUL). — Root crops are a good average. Farm stock is in good condition. Fall seeding is in good condition. The prices for farm crops have been very good. Potatoes have been our most profitable crop and strawberries our least profitable one. Strawberries are the leading crop in this locality, more acres being devoted to that crop than all others, and this year they hardly paid for picking. The beds for another year look well, but the number of acres is much less. Considered as a whole the season has not been a profitable one.

Somerset (JOSEPH GIBBS). — Root crops have been average crops. Farm stock is in good condition. Fall seeding is in excellent condition, owing to much rain. Prices of farm crops have ruled below the average. Tomatoes, celery and early cabbage have paid well. Potatoes were an average crop and those who have held them expect to realize better prices. Strawberry growers have lost heavily the past season in consequence of low prices. Apples are an entire failure. Considered as a whole the season has not been a profitable one.

Dartmouth (L. T. DAVIS). — Root crops have not been better for some years. Farm stock is in extra good condition in most cases. Fall seeding is in very good condition having had plenty of moisture. Prices are from 15 to 25 per cent below the average.

Milk has been as profitable as anything and potatoes have been our least profitable crop. There has seldom been a worse season for our farmers than the past one for returns from sales.

PLYMOUTH COUNTY.

Marshfield (J. H. BOURNE). — Root crops are in good condition. Farm stock is in better condition than usual. Less ground has been seeded than in former years, but young grass looks well. Potatoes do not bring as high a price as last year. Sweet corn, potatoes and milk have been our most profitable crops and hay our least profitable one. The season has been about an average one except to those depending on the sale of hay. There are very few apples in the market. The cranberry crop has been better than was expected and above the average.

Duxbury (A. M. GOULDING). — Root crops are up to the usual average. Taken as a whole farm stock looks better than for several years. Fall seeding is not above the average in condition and perhaps not quite that. Prices for farm crops have been fully as low as usual. Corn has been our most profitable crop and potatoes our least profitable one. The season has been a profitable one, for while prices are low most crops have been abundant. The apple crop is very light, not enough for home consumption.

Kingston (J. H. CUSHMAN). — There are full average crops of roots. All stock is looking well. Fall seeding is looking well. Prices have averaged about as in former years. Hay has been our most profitable crop and apples our least profitable one. The year has been fully up to the average for profit.

Bridgewater (R. CASS). — Root crops generally are below the average. Farm stock is in good condition. Very little fall seeding has been done but the early sown is in good condition. Prices for farm crops have been a fair average with other years. Potatoes have paid fairly well on some farms. Sweet corn has not paid expenses. Taken as a whole I do not think the season has been a profitable one for farmers in this locality.

Lakeville (ELBRIDGE CUSHMAN). — Root crops are up to the usual average. Farm stock is in good condition. Fall seeding is in good condition. Prices for crops raised for market have been below the average. Corn has been our most profitable crop and hay our least profitable one. While the yields of farm crops have been good prices have been low and many farmers have not realized as much as in other years.

Marion (J. B. BLANKINSHIP). — Root crops are up to the usual average. Farm stock is in good condition. Fall seeding is look-

ing well. Onions have been a good crop and cranberries a fair one. Potatoes rotted quite badly. Apples are a small crop.

Mattapoisett (A. R. SWIFT). — Root crops are up to the usual average. Farm stock is in good condition. Fall seeding is in good condition. Hay is lower and potatoes are higher in price than usual; other crops about average. Hay has been our most profitable crop and oats our least profitable one. Considered as a whole the season has been a profitable one.

BARNSTABLE COUNTY.

Bourne (D. D. NYE). — Root crops are up to the usual average. Farm stock is in very good condition. Fall seeding is in fair condition. Prices for farm crops have been about average. Hay has been our most profitable crop and potatoes our least profitable one. Cranberries are looking up and are a very good crop in this vicinity. Take it as a whole this year has been as good as former years and some crops have done better.

Mashpee (W. F. HAMMOND). — Root crops have proved about up to the average. Farm stock is looking well and bids fair to enter the winter under favorable conditions. Fall seeding is looking well. Market crops have brought about average prices. Hay has been our most profitable crop and corn our least profitable one. The season has been a profitable one for our farmers.

Barnstable (JOHN BURSLEY). — Root crops are up to the usual average. Farm stock is in good condition. Fall seeding is in fair condition. Prices have been about as for the last few years. Cranberries have been our most profitable crop although they suffered from scald and early frost; better prices are indicated for the late keepers. Absolutely no apples in this section. The season has been a moderately profitable one.

Chatham (E. Z. RYDER). — In some cases lack of rain has shortened the root crops, which otherwise would have been above the average. Farm stock is in good condition. Fall seeding is looking well. Prices of market crops have compared well with former years. Hay has been our most profitable crop and corn our least profitable one. Cranberries are considerably below an average crop, owing to extremely hot weather which scalded the berries. Considered as a whole the season is a little above the average.

Eastham (J. A. CLARK). — Root crops promise well. Farm stock is in good condition. Not much fall seeding has been done, but what there is in looks well. Prices for root crops have been about average. Asparagus is the leading crop and has probably been the most profitable one. The profit of the season will de-

pend in a great measure on how the root crops turn out and the prices obtained, should say it might be an average season.

Wellfleet (E. S. JACOBS). — Root crops, especially turnips, are hardly up to the average. Farm stock is in good condition. Fall seeding is about in average condition. Prices for farm crops have been very much as usual. Cranberries have been our most profitable crop and apples our least profitable one. I think the season has been quite a profitable one.

DUKES COUNTY.

West Tisbury (GEO. HUNT LUCE). — Root crops are in good average shape. Farm stock is in very good condition. There has not been much change in the prices obtained for farm crops. Hay has been our most profitable crop and corn our least profitable one. The season has been about an average one as far as profit is concerned.

NANTUCKET COUNTY.

Nantucket (C. W. GARDNER). — Root crops are up to the usual average. Farm stock is in fine condition. Not much fall seeding is done here. Prices for farm crops have been much below those of other years. Indian corn and sweet corn have been our most profitable crops and potatoes our least profitable one. The season has been one of good crops but poor prices.

BULLETIN OF
MASSACHUSETTS BOARD OF AGRICULTURE.

STABLE DISINFECTION.

By Prof. JAS. B. PAIGE, *Veterinarian to the Board.*

The most satisfactory and least expensive method of dealing with the diseases of domestic animals is to prevent them. In many instances this may be done to advantage, with but little trouble on the part of the owner.

The prevention of disease is more under control of the one having immediate care of animals than the veterinarian, who is only consulted, or directs as to the best methods of prevention. This applies to such disorders as arise from improper feeding or watering, over-working, not allowing sufficient exercise to keep in a healthy condition; to disease, occurring in connection with keeping animals under unsanitary conditions; for example, keeping animals closely confined in stables where there is defective drainage, or where there is a deficiency of pure air or insufficient light, — in general, where conditions are such as tend to weaken the constitution and open the way for the easy development of disease.

The scientific study of animal pathology and bacteriology during recent years has demonstrated that a large proportion of the animal diseases is caused by the introduction into the body of microscopically minute particles of living vegetable matter, whose growth in the body fluids or tissues, or the action of whose product of growth upon the different organs, gives rise to this or that disease.

This applies to most disorders of a contagious or infectious nature. The organisms causing the diseases are given off from the bodies of the affected animals, and are brought in contact, through the medium of the air or by some similar means, with the bodies of the healthy animals.

We know that certain of these contagious diseases have a specific cause in the form of an organism possessing peculiar characteristics by which we are able by bacteriological methods to detect

its identity. Under all conditions this organism retains its characteristics, and in all cases gives rise to the same disease.

For example, the organism of tuberculosis always produces this particular disease, and by no means whatever can it be so altered that it may produce another, such as glanders. When liberated from the body of a diseased animal, the germs may under certain natural conditions retain their vitality for a very long time, in some instances even months and years. Then, if after this long time they are again brought under favorable conditions inside the body of a susceptible animal, they may develop and produce disease.

The object of disinfection is the destruction of these disease-producing organisms and parasites, as well as the cleansing of the stable of other objectionable impurities existing in the form of living matter which may gain access to the milk, impairing its keeping qualities, imparting to it an objectionable odor, color or flavor.

The fact that it is impossible for one of the contagious diseases to develop independently of the particular organism which can produce it, and that the organism can only originate in an animal suffering from the disease, shows the necessity of destroying or rendering it inactive before it can gain access into the healthy individual.

Disinfection and thorough cleaning, as viewed from the bacteriologist's point of view, are essentially the same. Nature has provided us with one of the most powerful disinfectants we possess, namely, *sunlight*. In order to avail ourselves of it, we must so construct our barns that it may act to the best advantage. Active, virulent cultures of the germs of tuberculosis, glanders, typhoid fever or diphtheria are rendered perfectly harmless if exposed to the action of direct sunlight for a few hours. The same is true where the germs are given off from the body of a diseased individual, provided they are not protected from the direct action of the light by being enclosed in other matter, such as mucus, pus, faeces, etc. Diffuse daylight has a disinfecting action but is much less powerful than direct sunlight. Where one or two hours' exposure to the action of direct sunlight would suffice to destroy disease-producing organisms, several days or weeks might be required to accomplish the same thing by diffuse light.

Sunlight not only acts beneficially in the stable by destroying objectionable micro-organisms that may be present, but it has a beneficial effect upon the animals kept in such a stable. Occasionally we see stables arranged in such a manner that the animals are placed upon the shady north side, while the sunny south side

is used for storage purposes. The action of sunlight upon the animals is to increase the red blood corpuscles and to stimulate and strengthen all the organs of the body. Well-lighted stables are invariably much dryer than dark ones. This is a distinct advantage in favor of keeping the stable clean and the animals in it free from disease. The disease-producing microbes find much more favorable conditions for retention of their vitality or growth and multiplication where the atmosphere contains large quantities of moisture, rather than when it is dry. Ordinary drying is, in fact, all that is necessary to destroy some of the most dangerous germs. This does not apply equally to all; while Asiatic cholera germs are quickly killed by drying, those of tuberculosis are only slightly affected by it.

Animals kept in dark, damp underground stables are much more subject to disease than those kept under better sanitary conditions. This applies to all domestic animals, but more especially to horses, which soon become hidebound, rough-haired, and suffer from coughs, colds, etc.

Tuberculosis in cattle, glanders and influenza in horses, hog cholera and swine plague in swine, and similar diseases, appear more quickly, spread more rapidly and are much more fatal among animals kept in dark, damp, underground stables than among those kept in light, dry, airy barns. Simple wounds often become unhealthy and gangrenous, leading to a fatal termination, among animals under unsanitary conditions, whereas, upon those under good hygienic surroundings, they heal quickly. In the first instance they become quickly infected with the organism producing suppuration, gangrene and blood poisoning, while in the second instance no such infection occurs.

Heat is one of the best disinfectants which it is possible to employ. All life, both animal and vegetable, is quickly destroyed when subjected to the action of a high temperature. It may be employed in one of several forms; — a flame, dry heat or moist heat.

When it is advisable to absolutely destroy material contaminated with infectious matter, there is no safer way to dispose of it than by burning. Wood work, such as mangers, hay racks, stall partitions, floor, etc., that may have become thoroughly infected with such material as the nasal discharge from glandered horses, is best disposed of by burning. The bodies of animals dying of infectious diseases which may be transmitted to other animals by eating the flesh or by contact with the offal or discharges from the dead body, are safely gotten rid of by cremation. Burning is preferable to

burying, as certain organisms find in soil favorable conditions for their preservation and multiplication.

Fire may be used to disinfect iron, stone, or brick work or other materials of a non-inflammable nature by passing a flame over it. An ordinary gas or Bunsen burner attached to the gas fixture by means of a flexible rubber tube affords a convenient means of securing a flame for disinfecting purposes.

Dry heat is applicable to the disinfection of certain objects that cannot be subjected to the action of the flame or to moist heat. Brushes, curry combs, blankets and similar objects that may have been in contact with animals suffering from contagious disease are sterilized by baking. Special apparatus for this purpose has been invented and manufactured for use in quarantine stations, hospitals, etc. For all practical purposes on the farm an ordinary stove oven is all that is required. The article to be disinfected should be put into the oven in as loose a condition as possible, in order that the heat may penetrate to every part. Twenty minutes' exposure at a temperature of 300° F. is sufficient to destroy any harmful organism that may be present. If no thermometer is at hand by which the temperature may be taken, a small quantity of ordinary cotton batting may be used. Lay it out loosely on the article to be disinfected; when the temperature has risen sufficiently high to give a slightly brownish color to the cotton, one may be assured that disinfection is completed.

Moist heat in the form of boiling water or steam may be used as a disinfectant for those parts of a stable or those objects about it that cannot, owing to their nature, be treated by fire or dry heat.

Washing thoroughly with boiling water is very effective as a means of disinfection. Warm water in which the hands can be borne cannot be relied upon. To do the work, it must be quite near the boiling point, and requires to be applied with a mop or a broom. Live steam applied directly from a steam-pipe or hose is much more active than boiling water. It acts very energetically and quickly. To steam walls, floors, mangers, etc., is a sure and satisfactory way of disinfecting them. Pails, blankets, tools, etc., may be either boiled or steamed by immersing them in water or by placing them over boiling water in a tightly covered kettle. An exposure from twenty to thirty minutes is sufficient time to disinfect, provided the object is of such size or texture that the steam or water can readily come in contact with every portion during the greater part of the time.

There are numerous chemical substances that destroy infectious matter. In certain cases it may be advisable, on account of

greater convenience or other circumstances, to use one or more of these, in place of those means already mentioned. Among the large number of such substances are carbolic acid or similar preparations, corrosive sublimate, chloride of lime, sulphur fumes or chlorine gas.

Carbolic acid is a cheap, effective disinfectant, but, owing to its caustic nature, must be used with care, to avoid accidents. The strong acid brought in contact with the skin quickly destroys it. All solutions, whether weak or strong, taken internally in considerable quantities are irritating and poisonous.

Carbolic acid is sufficiently soluble in water so that a five per cent solution may be made. If more than one part of acid is added to twenty parts of water, the excess remains in suspension as pure acid. A five per cent watery solution is sufficiently strong to destroy most germs inside of one hour, provided the organisms are kept continually moist with it. A solution of this strength is not caustic, but so irritating that with most persons it will at first cause tingling and later numbness of the hands or other parts of the body with which it may come in contact for any length of time. A five per cent watery solution may be used for the disinfection of walls, floors, mangers, harnesses, excrement, offal, etc. For use upon floors and walls it may be applied economically by means of a pump; preferably such a one as is employed for spraying fruit trees. Thrown in a fine spray against the walls, it penetrates into all the cracks and crevices. There is little danger in using a five per cent solution about mangers or feed troughs if they are allowed to become thoroughly dry before being used.

Carbolic acid solutions are particularly effective for ridding stables, pig pens and hen houses of lice and other parasites. One part of acid and twenty or thirty parts linseed oil makes an excellent mixture for application to the skin of animals harboring lice or other animal or vegetable parasites.

For disinfecting soils, manure heaps or bodies of animals, stronger mixtures than five per cent solution may be used. Crude acid is suitable for all disinfecting purposes of buildings, but only the better grades should be applied to the bodies of living animals.

To increase the efficiency of carbolic acid as a disinfectant, some advise the use of sulphuric acid in combination with it. The United States Department of Agriculture a few years since recommended the use of the following mixture, and gave these directions for its preparation and use: —

Crude carbolic acid, one-half gallon; crude sulphuric acid, one-half gallon. It is not poisonous, but quite corrosive, and care should be taken to protect the eyes and hands from accidental splashing. These two substances should be mixed in tubs or glass vessels. The sulphuric acid is *very slowly* added to the carbolic acid. During the mixing a large amount of heat is developed. The disinfecting power of the mixture is heightened if the amount of heat is kept down by placing the tub or glass demijohn containing the acid in cold water while the sulphuric acid is being added. The resulting mixture is added to the water in the ratio of one to twenty. One gallon of mixed acids will thus furnish twenty gallons of a strongly disinfectant solution having a slightly milky appearance.

Creolin, lysol, disinfektol and other coal-tar products which closely resemble carbolic acid in their composition and action may be used for disinfection in place of the latter. While less caustic, irritating and poisonous, and possibly slightly more active as disinfectants, they are not so easily obtained as carbolic acid, and are for practical purposes but little if any better.

Corrosive sublimate (perchloride of mercury) is a very poisonous, caustic and corrosive chemical, and must in all cases be used with great caution, to avoid fatal results. It is the strongest disinfectant for practical use that we have. As small a quantity as one part to forty or fifty thousand parts of meat infusion will prevent the growth of bacteria in it. Stronger solutions are used for disinfecting purposes, one part to one thousand parts of water or one to five hundred parts of water being the strength of the mixture usually recommended. Approximately, sixty grains of sublimate to a gallon of water or one ounce to eight gallons make a solution of one to one thousand parts. It should always be mixed and kept in glass jars or wooden tubs, as it quickly corrodes metals. The mixture should be well stirred and allowed to stand for several hours, in order that the sublimate may become thoroughly dissolved.

Never allow it to remain uncovered, where it is accessible to man or animal.

It may be applied with mop or brush, or better with spraying apparatus, as advised for carbolic acid. When mixed with dirt, especially manure, it loses its strength in proportion to the amount of foreign substances present. For this reason all dirt should be removed from the walls as thoroughly as possible by washing and scraping before the sublimate is applied. Mangers, troughs, pails, etc., that have been treated with sublimate, should be carefully rinsed several times before being used again.

As carbolic acid, creolin and the other coal-tar products are less dangerous, it is better that they be used unless the use of the sublimate can be entrusted to an intelligent and reliable man.

To destroy infectious matter in the air or in those parts of the stable that cannot be easily or thoroughly treated by those disinfectants already mentioned we must employ an aerial disinfectant. As a precautionary measure to insure thoroughness it is frequently advisable to use an aerial disinfectant in conjunction with one of those previously discussed. Gaseous disinfectants will penetrate into cracks and corners that cannot be reached with liquid preparations.

The two gaseous disinfectants most available for ordinary use are *sulphur dioxide* and *chlorine*.

The former has been employed for cleansing purposes for many years, and experience has shown that it is a very effective destroyer of pathogenic organisms. To get satisfactory results, certain rules must be observed in its use. Experiment has demonstrated that it is much more effective in a moist atmosphere than in a dry one. It is therefore advisable to thoroughly sprinkle all walls, floors and ceilings of the space to be disinfected before the gas is generated. To do its work well the sulphur fumes must be present in the atmosphere to the extent of about three and one-half per cent. Three pounds of sulphur are required for each one thousand cubic feet of space. That the best results may be obtained, all doors, windows, ventilators and other openings should be tightly closed, that the gas may be kept confined for at least twelve hours. The disinfection will be better if retained for twenty-four hours.

To liberate the gas, it is only necessary to burn the sulphur. That form called "flowers of sulphur" is more convenient than rolls or sticks. The sulphur is placed in an iron kettle or upon a shovel, which may as a precaution against fire be set upon a brick surrounded by water in a wash tub or half barrel. A little alcohol may be sprinkled upon it and then lighted or a few live coals may be thrown upon it to start it burning. If the room to be disinfected is large it is better to burn sulphur in several places rather than in one, or one vessel containing it may be moved from place to place at frequent intervals. The disadvantage of the latter method is the difficulty of entering the room on account of the fumes, and again, in opening doors frequently more or less gas escapes.

Animals should not be returned to the stable until it has been thoroughly aired.

Chlorine gas is a powerful disinfectant and deodorizer. It is rather more active than sulphur fumes, and also much more irritating and corrosive. Like sulphur dioxide, chlorine destroys bacteria more readily in an atmosphere containing large quantities of moisture rather than in one free from it; hence the advisability of sprinkling the floors and walls before using. It requires about one per cent of chlorine gas in the atmosphere in order to be sure of disinfection. It is easily generated by adding hydrochloric or sulphuric acid to chloride of lime or ordinary bleaching powder. Five and one-half pounds of chloride of lime and an equal quantity of sixty per cent sulphuric acid mixed together will produce sufficient chlorine gas to disinfect one thousand cubic feet of space.

Care must be taken in using the sulphuric acid, as it is very caustic. It acts less violently when added to the lime if diluted by the addition of an equal quantity of water. If diluted, five and one-half pounds of acid must be used, the same as if no water were added. The acid and lime should be mixed either in earthen, glass or wooden vessels; ordinary stone jars are suitable for this purpose. Metals of all kinds are quickly destroyed by the acid.

The chlorine gas does not require as long a time to destroy germs as does sulphur dioxide; five or six hours are usually sufficient. The longer it acts, however, the more thorough the disinfection.

It is always to be borne in mind that sulphuric acid and chlorine are to be used with great caution, to prevent accidents. During fumigation all animals should be removed from the building, and should not be returned until it has been well aired.

In the work of disinfection it is all-important that it be done thoroughly. Everything which has come in contact with the diseased animals, including clothing, cleaning utensils, pails, and even the hands of the person attending the sick, should be carefully treated. Too great care cannot be exercised in this connection. The success of getting rid of contagious matter from a building depends wholly upon the thoroughness of disinfection, provided the source of contagion has been removed.

